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ABSTRACT

A series of marketing and early intervention strategies were developed to increase female enrollment in technology education (TE) in a New Jersey township with residents of all social classes/income levels. Among the main project activities were the following: (1) development of a comprehensive curriculum intervention called Technology Education for Lifelong Learning Skills (TELLS), which focused on implementing interdisciplinary gender-neutral technological problem solving in the classroom; (2) presentation of an evening program to increase interest in TE among fifth graders and their parents; (3) organization of a TELLS conference to disseminate information about the curriculum; and (4) development of new curriculum materials, business/technology newsletters, and public relations presentation materials for grades 9 through 12. The initiatives resulted in an increase in female enrollment from 10% to 12% in the grade 8 technology elective course; however, female enrollment in TE in grades 9-12 remained at its previous level (9%). It was concluded that the project was not long enough to bring about the changes in student, teacher, and counselor attitudes required before female enrollment in TE increases significantly. (Contains 45 references. Appended are the following: project survey instruments, information about TELS grant activities and personnel, and sample public relations materials and learning activities.) (MN)

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ED 377 336

Marketing and Early Intervention Strategies to Increase Female Enrollment in Technology Education

by

Joyce J. Maehrlein

A Major Applied Research Project Proposal
presented in partial fulfillment of the requirements
for the degree of Doctor of Education

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A Major Applied Research Project Report
presented in partial fulfillment of the requirements
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Nova University
National Ed.D. Program for Educational Leaders
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Abstract

Marketing and Early Intervention Strategies to Increase Female Enrollment in Technology Education

This report describes strategies used to increase female enrollment in high school and middle school technology education programs through early interventions at the elementary level. Although technology education is a required course for grade 7 and 8 students, females were not choosing to continue study in technology education in the high school elective program as shown in enrollment numbers. The problem was identified as stereotypic male and female role perceptions of children at the elementary level.

Analysis of enrollment patterns followed the literature--females were not pursuing advanced level mathematics, science, and technology courses, and the technology program experienced the lowest female enrollment of the three programs. Possible causes were determined to be stereotypic perceptions on the part of adults as much as the children.

A major solution strategy was a curriculum intervention made possible by resources secured through a New Jersey State Grant. This intervention would include enhancing elementary curriculum using a problem solving approach and retraining staff in the new methods. Initiatives at grades 7 through 12 would include new curriculum units, newsletters, and public relations presentations and materials.

The initiatives resulted in a female enrollment increase from 10% to 12% in the grade 8 technology elective course. The grades 9 through 12 technology program had 9% female enrollment, falling short of the 20% goal. Results are analyzed and recommendations made for future interventions. An evening family technology program was planned and implemented at grade 5 to increase interest in and awareness of technology education. A major elementary-level project resulted in the development of a comprehensive curriculum guide for implementing interdisciplinary technological problem solving in the classroom while being sensitive to gender neutrality. A two-year initiative was planned to continue beyond the initial project with the goal being to change female attitudes toward technological courses and careers and increase enrollment in technology education at the high school level.

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Chapter 1

Problem Statement and Community Background

General Statement of Problem

After five years of required enrollment of all grade 7 and 8 students in Introduction to Technology, a nine-week introduction course, the elective technology education program, grades 8 through 12, has seen only limited success in attracting female enrollment.

The high school had enrollment of 7 females of 73 enrolled students (10%) in 1988-1989, 9 females of 98 enrolled students (10%) in 1989-1990, 4 females of 113 enrolled students (3%) in 1990-1991, and 17 females out of 170 enrolled students (10%) for 1991-1992. Junior Engineering, the eighth-grade elective at the intermediate school, has never had more than 2 girls enrolled out of approximately 52 students during any year since 1986.

The Immediate Problem Context

General Information. During the 1991-1992 school year, there were 647 students enrolled at Randolph Intermediate School (grades 7 and 8) and 1,194 students enrolled at Randolph High School (grades 9 through 12). These schools embrace a grade 7 through 12 departmental structure with administrative subject supervisors state certified in their discipline as well as in administration.

There are four elementary schools in the district with a kindergarten through grade 6 structure in each school. Starting in grade 1 students are taught through a team concept. Students have two different teachers for their core subjects. Other special subjects, such as art, computers, and physical education, are taught by staff dedicated to the special subject. Each elementary school has one principal with no other building administrator. The Coordinator of District Programs is responsible for kindergarten through grade 6 curriculum, with input from the grades 7 through 12 subject supervisors, and is directly responsible to the Assistant Superintendent for Curriculum and Instruction.

The Director of Pupil Personnel Services oversees kindergarten through grade 12 guidance services. Because of financial constraints, there are no guidance services in the elementary schools. This is a continuing district concern. There was hope that an elementary guidance program would commence for the 1992-1993 school year; however, no financial resources were dedicated to make it a reality. There are two counselors at the intermediate school (one female, one male) and six counselors at the high school (three female and three male).

Elementary Schools. All four elementary schools are overcrowded. Plans include moving grade 6 to the intermediate school beginning in September 1994 to help relieve the overcrowding. The intermediate school can house 1,200 students, but contained only 657 students in grades 7 and 8 in 1991-1992. There has been relatively stable enrollment in each elementary grade with about 300 students at each grade level divided among four elementary schools.

Intermediate School. During 1991-1992 there were 657 students enrolled with 49% female population. During that year the largest class in the district was grade 7 with 360 students. The facility was the original high school so the science rooms and special areas, such as home economics, are well equipped. There is a team structure for the academic program with special subjects excluded from that structure. Special subjects include music, communication arts (photography and video arts), art, home economics, foreign language, technology education, and business education (computers only). Special subject teachers are not embraced as part of the team concept nor are they scheduled as part of a team. The team teachers teach four periods a day with one period daily dedicated to team meetings. The special-subject teachers teach six periods a day. The school has one principal and one vice principal.

When the grade 6 class begins attending this facility in September 1994, the school will be renamed to denote its middle school status. The program of studies will be adjusted to incorporate the grade 6 students, and the team concept will apply to grades 6, 7, and 8.

There are eight 42 minute periods a day. Grade 7 students are involved in the special areas through nine-week cycle courses. Grade 8 students have one full-year elective option and their nine-week cycle program offers them choices not available in grade 7.

High School. During 1991-1992 there were 594 females enrolled at the high school representing 50% of the total enrollment. Ninety percent of the Class of 1990 and 92% of the Class of 1991 continued their education at the post-secondary level, according to statistics gathered from the students themselves. In order to gain acceptance to institutions of higher learning, students must be aware of Carnegie units required, class rank, and other college acceptance criteria. The high school guidance counselors continually remind students of the basic college acceptance criteria and parents express the concern that their child's schedule be rigorous enough to ensure acceptance to a good college, although their perception of a good college does vary according to the guidance counselors.

Course selection is impacted by college acceptance criteria and class ranking status of various courses in the high school. Randolph's class ranking criteria favors the academic program over the elective program in weighted rank. The only possible selection in the school day with a ranking lower than an elective is a study hall. Three of the six high school guidance counselors have discussed the issue of low weighted rank of elective courses with the manager. They have received responses from parents and students regarding this low weighted rank, and in some cases the elective program has been rejected in favor of selecting academic courses which would enhance their class ranking to a greater degree.

The high school day consists of eight periods in which to choose courses, with lunch scheduled outside those eight periods. Each period is 41 minutes in length. Students are required to select a minimum of seven courses each of their high school years. After required courses are scheduled, grade 9 students typically have one period in which to choose an elective if they do not select a study hall, grade 10 has two free-choice periods, grade 11 has five free-choice periods, and grade 12 has six free-choice periods.

The Surrounding Community

Randolph Township consists of 22.88 square miles in the center of Morris County, New Jersey, with primarily a residential tax base. The township is in close proximity to major national and international corporate headquarters.

The Township's population was approximately 21,000 with a total school enrollment just over 4,100 as of September 1991. Of the school-age children in the district, approximately 30% attended the high school, 16% attended the middle level school, and 54% were elementary students. The socioeconomic makeup varies in each of the elementary schools. Shongum School boundaries encompass primarily upper middle class, white collar professionals. Center Grove School and Ironia School are mixtures of upper middle class, young couples in first homes, and a blue collar population. Fernbrook School has the largest low-income population. Sixty percent of Fernbrook's 1991-1992 kindergarten population was in need of basic skills remediation. This school also had the largest population of non-English speaking families, primarily from South America and India. Regardless of their backgrounds or housing arrangements, many parents choose to live in Randolph because of the excellent reputation of the schools.

The majority of the population (77%) lived in single family dwellings. The recent influx of minority and non-English speaking students tended to be one result of low- to moderate-income housing (apartments).

Chapter 2

Problem Definition and Evidence

Problem Background

The grades 7 through 12 technology program is designed as a pre-engineering study area involving extensive interdisciplinary learning through the problem-solving method as it relates to inventing solutions to human problems. There are extensive hands-on projects and activities related to the topics covered; and although students are given specifics of problems they are to consider, the problem solutions are totally open ended encouraging creativity. Although an interdisciplinary approach is used in technology education, there tends to be a heavier emphasis on mathematics and science (with less emphasis on the humanities) due to the nature of the technological topics studied, such as simple machines, transportation, and aerodynamics.

The nine-week Introduction to Technology course is a requirement for all grade 7 and 8 children prior to starting high school. Even with this requirement, there was little evidence between 1989 and 1991 that enough interest in the subject area was established to encourage student enrollment in the elective high school technology program. The students who did enroll were predominately male.

Table 1 summarizes the general patterns of grades 9 through 12 course selection when examined over two school years, 1989-1990 and 1990-1991. Stereotypic problems of poor female enrollment in computer

Table 1

Two-Year Comparison of Technology-Related Course Enrollment

Course	1990-1991 Female	1990-1991 Male	1989-1990 Female	1989-1990 Male
Technology Education				
Principles of Technology	0	13	2	20
Electronics Technology	1	46	0	0
Drafting and Design: Level 1	2	28	4	39
Level 2	0	12	3	20
Level 3	1	14	0	5
TOTAL:	4	113	9	84
Students Eligible to Enroll:	594	600	595	599
Percent of Eligible Enrolled:	1%	19%	2%	14%
Computer-Related Courses				
Computer Applications: Level 1	30	27	24	33
Level 2	5	6	7	15
Computer Programming	5	18	3	19
Fortran/Pascal	1	12	2	8
AP Computer Science	1	14	0	4
TOTAL:	42	65	369	79
Students Eligible to Enroll:	446	441	450	450
Percent of Eligible Enrolled:	9%	15%	8%	18%
Mathematics--Electives Only				
Algebra II				
Trigonometry	113	123	126	113
Finite Mathematics	15	16	17	16
Pre-Calculus	15	20	41	66
Calculus	72	68	0	0
AP Calculus	11	16	21	8
	7	15	5	4
TOTAL:	253	258	210	221
Students Eligible to Enroll:	304	297	300	300
Percent of Eligible Enrolled:	83%	87%	70%	74%
Science--Electives Only				
Chemistry	74	84	103	85
Chem Tech	36	41	42	31
Physics	34	44	45	75
AP Physics	1	4	0	5
Advanced-Level Electives	21	26	23	28
TOTAL:	166	199	213	225
Students Eligible to Enroll:	304	297	300	300
Percent of Eligible Enrolled:	55%	67%	71%	75%

programming, advanced placement mathematics and science courses, and technology education were found. These findings were consistent with the Educational Testing Service (ETS) Policy Information Center (1989) survey results of high school seniors regarding their choice of intended college majors. Of the students surveyed, only 15% of those choosing engineering were female, implying that females did not have the interest in or the course background to pursue such career options.

Prior to 1988 there were no attempts to examine or address the fact that technology education was being omitted as an option by half of the high school population--the female half. An initial project was done in 1990 to explore the enrollment problem, primarily why female students were not enrolling in elective high school technology courses. An awareness campaign for students and parents was planned in order to increase female enrollment to 20% of total technology education enrollment, grades 9 through 12. The campaign was very successful in increasing enrollment in technology education for 1991-1992, but female enrollment, although larger than the prior two years, still only represented 8% of total enrollment. This simplistic awareness approach to a complex attitudinal problem was not sufficient to attract female students to the high school technology program.

Evidence of Problem Discrepancy

A survey (see Appendix A) was administered to all grade 8 students during November 1990 in an attempt to understand why technology courses were attracting less females than either mathematics or science. This survey, entitled Technology and Careers Awareness Survey, was administered by the grade 8 guidance counselor during homeroom over a two-week period. The manager and the counselor felt that consistency of having the counselor administer all surveys would help the students take the survey seriously. The breakdown of survey completers is shown in Table 2. The AA grouping denotes students who have met the district criteria for "gifted" classification. The ability groups are in ranked order, from highest to lowest.

Table 2

Technology and Careers Awareness Survey Completers Breakdown

Tracked Group	Female	Male	Total	Percent Total
AA	14	10	24	8%
High	72	74	146	50%
Intermediate	45	58	103	36%
Basic	7	10	17	6%

The survey results revealed large numbers of students, both male and female across all tracking groups, saying they liked mathematics and science. The specific breakdown showed that 70% of both the males and females said they liked mathematics, 78% of the females and 88% of the males said they liked science. The male interest in technology remained consistent with mathematics and science, showing 74% wanting to take more technology courses. Female interest, however, dropped significantly with only 44% saying they would take more courses. The typical comments noted were "I don't like that stuff," "I don't like building things," "I don't like having to think of things to build," which may reinforce the fact that girls approach problems differently than boys, are more positive about the experiences when initially grouped to work with other females only (Faulkner and Anderson, 1991), and need more time to get involved at the hands-on level. The technology teachers had not considered these issues prior to these results.

Through inservice activities during the 1990-1991 school year, the all male technology staff were sensitized to female needs in the classroom. The technology teachers implemented techniques which included more all-female grouping, more surveying of females for interest areas, and more displays featuring females succeeding in technology-related subjects. Posters and other visuals were purchased and displayed which highlighted females and males working together on technological problems.

This same grade 8 survey also found that 51% of the students said they knew enough about careers, yet 49% of those students didn't know the types of skills needed to succeed in various careers. Obviously, more career awareness activities must be offered students to enable them to build their knowledge base as it relates to career clusters and to ensure they are not closing their career options due to unwise course selection.

Sensitivity to female needs is especially important in technology-related programs due to the perception that mathematics, science, and hands-on technology are male activities. Doran (1991) felt that teacher-prepared classroom activities must be critically analyzed for gender neutrality and options should be available which allow students to choose from a number of activities. The middle-level technology teachers were also concerned that their activities, although well planned, were not appealing to female students. During the fall of 1990, the curriculum content in the middle-level program was examined and female students questioned as to the topics they would like to explore in technology class. Of the 30 randomly selected grade 8 girls questioned, the top four choices of activities they liked best, after being introduced to eight different areas and allowed to choose and explore four, were structures (bridges), computer graphics, controlled environments (hydroponic gardening with the building of geodesic domes or structured enclosures), and playground designing and building (structures). These topics were infused permanently as exploration topics in the grades 7 and 8 technology program for the remainder of the 1990-1991 school year. It is interesting to note that the structures activities were overwhelmingly the number one choice of the females questioned, but was one of the most popular with the males students as well. This reinforced our belief that a structures unit should be included and expanded to a major bridge-building project in the grade 8 elective, Junior Engineering.

All students were going to be surveyed over the course of 1990-1991 in Introduction to Technology to determine if these initial responses from randomly selected students were true for the larger population. After responses were collated, the curriculum for both Junior Engineering and Introduction to Technology would again be evaluated.

Junior Engineering had never attracted female students. Over a five year period, 1985 through 1990, a total of 5 girls enrolled with an annual total average enrollment of 52 students. Some of the problem was the perspective of the guidance counselors. When the manager initially discussed the need for increased female enrollment in Junior Engineering with each of the two middle-level counselors, they expressed a feeling that Junior Engineering was better for the boys and the home economics courses were more necessary for the girls.

To ensure that the units of study being covered in Junior Engineering were not discouraging female enrollment, three technology teachers and the manager carefully examined the course content to ensure the topics were appealing to both females and males. As a result of this curriculum examination in the spring of 1991, the structures and controlled environments units would replace the metric race cars and aerodynamics units in Junior Engineering for the 1991-1992 school year.

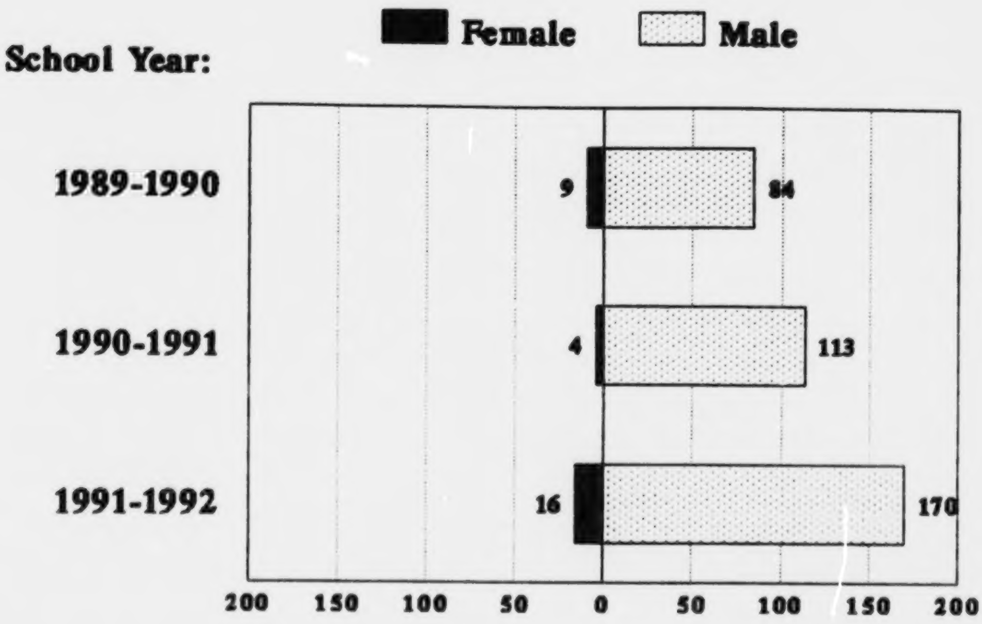
The manager met with the middle-level guidance counselors continually over the course of the 1990-1991 school year. They were invited to visit the technology classes and were continually contacted regarding results of surveys and female perceptions of technology education. Because the counselors play a critical role in helping children and their parents select their elective courses at grades 7 and 8, the counselors had to be convinced that discouraging female enrollment in a technology-based program could turn the girls away from technical career areas and the courses needed to support those careers. As of September 1991, the enrollment for the 1991-1992 school year was 6 girls enrolled in a total enrollment of 48 students in the middle-level elective, Junior Engineering. This was the best percentage ever seen in a non-required technology or industrial arts course at the middle level. The efforts with the guidance staff must, however, be a continual process. The manager still noticed some bias in discussions with the counselors about enrollments and female participation in technical programs. Considering females account for half the grade 8 population, females remain seriously under-represented in Junior Engineering.

Through project activities including evening meetings, parents were better informed of the value of technology education. As a result of information obtained by interviewing four high school females actively involved in technology education during the 1990-1991 school year, an awareness campaign for grade 8 students was also undertaken to ensure their understanding of the focus and purpose of technology education at the high school level. We were effective in increasing the high school technology enrollment by 59% for 1991-1992, very impressive by any standards but certainly for a non-required elective program. The female enrollment, however, still represented only 8% of total enrollment and was not particularly impressive when compared with male enrollment (see Figure 1).

After dealing with female attitudes in grades 7 and 8 throughout the 1990-1992 school years, the two middle-level technology teachers believed that the girls were already convinced that these activities were not for them and it was difficult to win them over regardless of the topics offered in the curriculum. In order to change stereotypic behavior, interventions had to begin in elementary school. This was mentioned consistently during interviews with the two technology teachers, the Supervisor of Special Projects, the Coordinator of District Programs (duties include kindergarten through grade 6 curriculum coordination), and the District Director of Pupil Personnel

Services. Meys (1991) believed it critically important to involve parents in any attempt to break down stereotypes which may be reinforced through parental words and actions at home, both consciously and unconsciously.

Figure 1. Three-Year Technology Enrollment Comparisons for All High School Technology Education Courses



Possible Causes

Technology education is a new approach and a new curriculum replacing out-of-date industrial arts courses. The approach has changed from the industrial arts product orientation, stressing proper machine and tool use in development of a finished product, to process orientation in technology education. The skills stressed in technology education are problem solving, critical thinking, and the application of mathematics, science, social science, and language arts in creatively solving technological problems. The research and development processes found in engineering are the same as those used to study the content of technology education.

Although the industrial arts teachers have been retrained in the process orientation and higher order skills needed in technology education, they are still thought of as "shop" teachers; and shop classes are perceived by parents, students, guidance counselors, and other teachers as being for lower ability male students. Throughout this project these perceptions continued to be evident in informal discussions with students and guidance staff. When questioned about their understanding of technology education and its value and pertinence to career choices, the bias was clear by their facial expressions and comments regarding the particular teachers teaching the subject. The teachers had good reputations and were liked by their students, but the subjects they taught were "only" shop classes.

Technology courses stress the application of mathematics, science, social science, and language arts skills to solve technological problems involving engineering concepts and research and development processes. Females are not pursuing careers related to mathematics, science, and technology. The ETS Policy Information Center (1989) reported large discrepancies between male and female high school seniors reporting their intended college majors. Engineering majors were predominately male, business was attracting slightly more males, and social science, health, and education were predominately female. They also noted the

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continuation of this pattern of choice differences in the Graduate Record Examination participants intended majors.

> Female students are 80 percent of those choosing education, 70 percent of those choosing comparative literature, 65 percent of those choosing anthropology, 50 percent of those choosing biological sciences, 41 percent of those choosing mathematics, and only 15 percent of those choosing physics or engineering. (p. 39)

This same stereotyping is evident in the enrollments at Randolph High School. In the 1990-1991 school year, females dominated word processing courses in the Business Education Department (over 90% female enrollment), but computer applications courses in that department, intended to challenge students interested in business management, had only 50% female enrollment in the beginning course and 43% female enrollment in the advanced course. The basic computer programming courses in the Mathematics Department had a total of 23% female enrollment, and that dropped to 14% for the advanced computer science courses.

Another perception problem may be caused by the practical applications courses offered in the Mathematics and Science Departments. They are designed specifically for the lowest ability students, yet the research and development model followed in technology courses is being copied by teachers in the highest level courses (i.e., Advanced Placement Physics and computer programming courses). There are obviously mixed messages about the value of applications processes and courses using those processes.

Staffing of those courses may help the misperception as well. There are no female role models (teachers) in the Technology Education Department. In the Science Department, practical application courses for low-ability students are taught exclusively by females, and high-level science courses stressing applications, such as physics, have no female teachers.

The stereotypic impression that hands-on activities in the mathematics/science/technology areas are male-oriented activities may begin before students even enter kindergarten. Part of the problem may be the result of female stereotyping from birth. Toys typically purchased for female children, such as dolls or tea sets, are not the open-ended activities that typify boys toys, such as blocks and trains, which encourage creative application of scientific principles and mathematics skills (Browning and Greenwald, 1990). These same open-ended activities and devices are the type found and used in technology class. This lack of experience in tackling such activities may be discouraging female participation in such activities later in their schooling.

There have never been special programs or emphasis on equity issues for teachers at any grade in district. Cooperative learning strategies were made a priority in the elementary schools beginning in the 1991-1992 school year. Cooperative learning strategies are an important component of technology education because teamwork is typically a requirement. If cooperative learning is to make a positive impact on children, particularly female children, then teacher awareness of unconscious bias and stereotypic teacher/student interactions is important.

There have been no attempts to educate the parents to the subtle and not-so-subtle stereotypes they may be fostering and which may be steering their daughters away from mathematics, science, and technology as career options. Equity issues must be addressed at school, but equity must be reinforced in the home.

Chapter 3

Problem Situation and Context

Policies

The District has become more sensitized to affirmative action issues since 1989. One result was a policy developed by the Randolph Board of Education (1989) designed to ensure equality in educational programs.

> #13. Ensure that school personnel do not use tests, procedures, or other guidance and counseling materials which are differentiated or stereotyped on the basis of race, color, creed, religion, sex, ancestry, national origin, or social or economic status. School personnel will in no way restrict or limit the options presented to students on the basis of race, color, creed, religion, sex, ancestry, national origin, or social or economic status when informing students about possible career, professional and/or vocational opportunities. (p. 3)

The Board of Education appointed an affirmative action officer who is aware of and concerned about female stereotyping. Originally being a mathematics teacher, she is concerned about female enrollment in technical fields and has shown continued interest in this project.

Norms, Values, Traditions

The seven teachers in the Technology Education Department are male. When questioned by the manager throughout 1989-1990, they were not sure if the classroom needs of female students were different from those of the male students. As retrained industrial arts teachers, they were not used to dealing with females in class. After having had one or two girls in their classes, they felt the females added a different and positive tone to the class. They also found that the females were among the better students in class.

February 14, 1991, a four-hour awareness session was held for all technology teachers. This session involved a presentation by a women recommended by the New Jersey Sex Equity Technical Assistance Center at Trenton State College. Her presentation was designed to increase each teacher's awareness of his own stereotypic behaviors and expectations as well as help alleviate biased language in the classroom. The manager met with each of the seven teachers after the awareness session. All the teachers felt the session had been valuable in pointing out their own gender-biased actions and language that they had been unaware of before the session. All seven teachers met with the manager one week after the awareness session to determine specific strategies they would address in their classrooms. Each of the teachers decided to make a greater effort to encourage their female students one-on-one and to work with the girls to increase their level of comfort in classes with predominately male enrollment.

There were also changes in the teachers attire. The technology teachers no longer came to school in "shop-teacher" clothes which were typically something neat but something that would not be ruined by dirt, grease, etc., such as jeans and a casual shirt. The technology teachers began to dress in shirt and tie. According to the teachers' contract, their supervisor cannot request a dress code. When asked why they decided to change their persona the three high school technology teachers felt that in order to change the perception that the courses they teach are shop classes, they must no longer look like shop teachers. They also expressed concern that the girls have no female technology teacher role models but they could at least see their technology teacher as someone who looked like a mainstream teacher and/or professional rather than a "shop" teacher.

Influence of Groups and Individuals

The guidance staff, grades 7 through 12, continued to be in the critical position of reinforcing or helping change perceptions of female participation in technology. Counselors visited technology classes in session. They agreed with the principles involved and the value of the subject matter and were impressed with the problem solving techniques used in relation to the needs of students hoping to major in mathematics/science/engineering in the future, both male and female. Counselors were becoming more educated about what technology education had to offer students and were impressed with talks and presentation made to them by technology students.

One of the technology teachers is an acknowledged leader in New Jersey's technology education movement. He developed the intermediate program (grade 7 and 8) over the past five years which has been recognized as a state model program. He received a $48,000, two-year (1990-1992) grant to upgrade his program, evaluate the effectiveness of the program, and disseminate his learning materials statewide. A second, identical grant, was received by one of the high school technology teachers for the same purposes at the high school level. The fact that there were six of these grants awarded statewide and Randolph received two of these six for a total of $96,000 was a strong factor in getting the interest of parents, guidance staff, teachers, and central office personnel. The recognition has brought interest in discovering why New Jersey feels our technology program is superior and interest in finding out exactly what technology education has to offer students. This was the most positive, far reaching facilitator we had seen to date. The state recognition impressed people at all levels within the organization and the community.

The District was subsequently awarded a $162,500 grant entitled Teaching Essential Life Skills (TELS). This grant was designed to incorporate technology principles and proficiencies and career awareness into the curriculum of kindergarten through grade 6. This sent ripples of wonder through the professional staff of each of the four elementary schools. There was not too much fear expressed, which is often the case when teachers foresee another pull-out program or another subject which they must incorporate into their already overcrowded schedule. From the manager's past experience with new elementary programs, the teachers would be strong proponents of the program if it helped them do their job better and more effectively and/or could relieve some of the pressure they felt in their overburdened day. Teachers were stressed because of large classes and the continual imposition of new or special programs which limited their student contact time. They were still expected to get all the usual requirements done in less time, with less help, and with more students. All four elementary principals expressed their own stress due to these issues.

The elementary principals expressed interest in the TELS grant activities primarily because they saw it as a way to secure guidance counselors (through career awareness) in their schools. This had been a goal of the four elementary principals for years, but had never materialized.

External Circumstances

Parents were unaware of the opportunities in mathematics, science, or engineering for their daughters. Interviewing girls involved in the elective technology program at the high school during 1990-1991 revealed that most of those girls had one or both parents in a technological career, mainly engineering. The same result was noted when interviewing the most actively involved girls in the technology courses and after-school club at the middle level. It appeared that unless the parents themselves were involved in engineering careers, the children were not encouraged to pursue that career option.

The elementary computer teachers have open houses for parents throughout the year at each elementary school's computer lab. They usually see about 20 parents in attendance. In June 1991, the computer teachers asked parents if they heard about the technology program being offered in the summer. This was a special program designed to generate interest in technology for students grades 4 through 6. No parents realized this summer program had a curriculum basis at grades 7 through 12. The only parents aware of technology education were those with older children who had gone through the intermediate school. Most parents believed that when you talked about technology education you were talking about computers. They had no concept of technology being anything other than equipment.

There was much awareness work to be done at the elementary level. In the manager's opinion, working at the elementary level offered the best opportunity for developing solid and continuing support for equity in technology, mathematics, and science career options and support for the technology education program by the parents and their children.

Chapter 4

Problem Conceptualization, Solution Strategy, and Project Outcomes

Bibliographic Research and Review of the Literature

Educational reform, with opinion and a wide range of strategies, has been examined over the last ten years by educators and non-educators alike. It has received extensive attention nationwide as a result of America 2000: An Education Strategy (1991) put forth by the National Governors' Association and endorsed by former President Bush. The former U.S. Secretary of Education, Lamar Alexander, touted the six national goals and a national testing policy as the answer to educational reform, yet civil rights and equal opportunity, among other issues vital to reform in urban areas, are conspicuous by their absence (Kaplan, 1991). Sadker, Sadker, and Steindam (1989) believed "the glaring omission of equity concerns, particularly the needs of girls in schools, from reform agendas suggests that the movement itself is in need of reform" (p. 44).

Throughout the country females are not choosing courses and ultimately careers in technology, mathematics, and science. Sadker and Sadker (1986) found the female dilemma unique: "What other group starts out ahead--in reading, in writing, and even in mathematics--and 12 years later finds itself behind" (p. 515)? Delli Santi (1990) found industry very concerned as the shortage of engineers becomes more serious. High-tech companies, worrying the shortage will become acute, are getting involved with institutions of learning in efforts to attract women and minorities into careers which industry itself helped create as the domain of the white male.

Educational Testing Service (ETS) social scientists (Westoff, 1979) researched stereotyping gender-role development across age levels. They found that stereotypic male and female roles are reinforced prejudices beginning even before birth. When the child does start school, he or she is already very aware of their gender and the stereotypic behavior expected of that gender (Westoff, 1979), and the schools seem to reinforce those stereotypes. The subtle and not-so-subtle prejudices and stereotypes of our culture are limiting female opportunities early in life; and the home, community, and school must supply opportunities for females to succeed in all areas of study (Educational Testing Service Policy Information Center, 1989).

Females appear to have a variety of problems in the schools, many subtly reinforced, which lead them away from risk-taking behaviors and positive self-esteem and self-confidence, necessary components to succeed in mathematics, science, and technology-related subjects (Greenberg-Lake, 1991; Project VOW; Leder, 1990; DeNys & Wolfe, 1985). In a study done by ETS sociologist Marlaine Lockheed, 25% of grade 4 girls thought they could be good leaders after hearing leadership criteria, however, only 18% of grade 5 girls felt so. In a follow up to that question, girls were asked if they would be comfortable being class president. Sixty percent of grade 4 girls said they would, but only 49% of grade 5 girls responded positively. Of the grade 5 boys, 62% said they would be comfortable as class president (Westoff, 1979). The girls were losing ground in the self-perception that they could aspire to leadership roles.

Being sensitive to female needs and preconceived notions is especially important in technology-related programs where situations may be exaggerated because of the perception that mathematics, science, and hands-on technology are male activities. Leder (1990), in examining a wide range of literature, found that boys and girls in primary grades performed mathematics with equal success, yet boys frequently did better than girls once in secondary school. Tocci and Engelhard's (1991) study, using 13-year old subjects, found that the greatest gender differences in attitude toward mathematics was on the stereotyping of mathematics as the domain of the male. One conclusion drawn from a nationwide poll commissioned by the American Association of University Women (AAUW) (Greenberg-Lake, 1991) was that "there is a circular relationship between liking mathematics and science, self-esteem, and career interests" (p. 15), and that school plays a major role in helping young men and women develop self-esteem and career preferences.

Sadker and Sadker (1986) believed classroom interaction critical to issues of self-esteem and career choice. The way teachers interact with students from the early grades may be discouraging females from exploring and questioning, which are vital components of technical areas. Sadker and Sadker's (1986) extensive studies on classroom interaction determined that the most valuable resource in any classroom is attention by the teacher, and the teacher is giving more attention to male students. "Males capture more and better teacher attention" (p. 512), and girls typically become sideline observers of discussions.

They believed that boys were actually being trained to be assertive through teacher acceptance of called-out answers. When girls demonstrated the same behavior, however, they were typically reprimanded which may result in training them for passive roles. At all levels of schooling males are asked more questions, given more precise feedback, criticized more, and given more time to respond. Because males tend to dominate teacher attention, it is the male population that shows greater educational gains over time. Females, as a group, enter school scoring ahead in all subject areas yet leave 12 years later behind in virtually every area (Sadker et al., 1989), but particularly in mathematics and science. These same inclusion inequities appear in the curriculum. Female contributions are seldom studied in history, literature, mathematics, and science reinforcing the stereotypic male dominance of worthwhile contributions to society (Sadker et al., 1989). Lytle (1990) cited not only the importance of teacher interactions with female students, but the importance of promoting cooperation between students rather than competition.

Faulkner and Anderson (1991) reported their experiences with children in their school using LEGO TC logo, an open-ended medium for exploring. They developed an after-school activity with mixed gender groups. Because of poor participation by females, they decided to schedule separate days for girls and boys. They noted very different ways in which boys and girls approach, use, and respond to the LEGO TC logo activities. The girls' "methods were very rigid," (p. 35) going to the direction booklets and precisely following the directions, many times not even changing the colors of the blocks from the colors shown in the pictures. Their end results were very sophisticated and over time they began to show creativity. The boys displayed creativity in their initial exposure to the activities and seldom referred to the direction booklets at all. The boys did, however, loose interest if the project seemed too complex.

When it came time to control their projects with the computer, the same passive role was displayed by the females initially, being content to be shown the possibilities without actually participating. The boys were more immediately excited about working with the computer. After working with the girls and boys and being sensitive to their different ways of working toward goals, it was found that both groups reached the same goal. It appeared that teacher sensitivity to the differences in male and female processing for problem solution will help in encouraging the females to be more creative. If females simply take more time to develop the self-assurance needed in order to show creativity in their activities, then the teacher must allow more time for females to succeed.

Bakon, Nielsen, and McKenzie (1983) believed that student willingness to interact with the teacher is critical in their decisions to drop out of computer courses. They found that students who asked for help from the teacher and who had access to a computer outside of the school were more likely to continue with computer courses. Female students were less likely to actively pursue help from the teacher than their male counterparts (Sadker & Sadker, 1986) which may account for the poor female enrollment in computer courses. Teacher sensitivity to this issue becomes important if they are to encourage the female students to continue with their computer studies.

Female role models are important for female students. Female students must have women they can look to as role models beginning in junior high school at the latest (McNamara & Scherrei, 1982; Sadker et al., 1989; and Lytle, 1990). Johnson (1989) found that simply reading about and discussing nontraditional role models in science and technology made no difference in young women's attitudes toward these careers.

In the model program known as Women Inquire in Science and Engineering (WISE), developed by the Educational Development Center, Inc. (1981), role models used as mentors are critical to the success of the program. They also found, however, that preferential programs segregating young women reinforces stereotypes and generates resentment of both genders. It is important to offer coeducational activities that reinforce equality.

Technology education offers an interdisciplinary approach to teaching based on problem solving. Unlike the scientific model which deals with the laws of nature and absolutes, the technology model deals in possibilities in an attempt to extend human capabilities. Technology education is a model for interdisciplinary study, but schools are typically not arranged and teachers are not trained in ways that accommodate interdisciplinary study or appropriate assessment.

Poor female participation in technology education is not surprising because technology education has been embraced as a separate subject area at the middle school and high school levels and many of the activities appear to be based more heavily on the applied sciences, industrial arts skills, and mathematics than any other area of study. Extending human capabilities is usually achieved through machines, and building machines as problem solutions within a technology classroom can be misconstrued as a male activity. But technology education is more than a building activity. Technology education is designed to help people understand the impact technological devices--past, present, and future--have on our lives and our society. Technological devices are "things" that through the centuries have helped people learn and extend their capabilities. As Selby (1988) expressed, "I have yet to find the teacher who would deny the capacity of things, from looms to lasers, clarinets to computers, to interest students" (p. 5). Using that built-in interest, teachers can motivate students to learn beyond the usual bounds of grade level knowledge. She also believed that technologies can be studied which are both "gender friendly and culture friendly" (p. 5). For children to become contributing adults in our fast-pace and quickly-changing society, they must be comfortable with change, be critical thinkers, and be problems solvers--competencies central to technology education.

Gursky (1992) summarized the work of Howard Garner, The Unschooled Mind: How Children Think and How School Should Teach, by stressing that people's real lives usually revolve around projects, yet rarely are projects a part of schooling. Technology education is designed around implementing interdisciplinary projects. The goal of these projects is to encourage students to use a broad base of knowledge in their search for solutions to technological problems. The research on good teaching supports this type of teaching-learning strategy.

> Effective teachers create learning situations in which their students are expected not just to learn facts and solve given problems but to organize information in new ways and formulate problems for themselves. Such learning situations include creative writing opportunities in language arts, problem-formulation activities in mathematics, and independent projects in science, social studies, and literature. (Porter & Brophy, 1988, p. 81)

Sellwood (1989) believed the challenge to schools is great. Because knowledge has doubled in the last ten years and is expect to treble in the next ten, knowing what precise skills to teach children is difficult. Therefore, the skills taught must be broad based, such as critical thinking and problem solving, which enable students to adapt to and cope with continual change.

> Problem solving is not something to switch on and off, it should be developed as a constant. Problem solving is the basis of all good teaching practice. . . It is an investigative approach that should have its foundations in early schooling and develop with each stage of education. (Sellwood, 1989, p. 3)

Cooperative learning, an integral component of technology education processes in the classroom, has been shown over the last ten years to increase student achievement (Joyce, Showers, & Rolheiser-Bennett, 1987). Joyce et al. (1987) found that "cooperative learning is overwhelmingly positive, . . . are appropriate for all curriculum areas" and that "the more complex the outcomes (higher-order processing of information, problem solving, social skills and attitudes), the greater are the effects" (p. 17).

Slavin (1987) told us that "people working together toward a common goal can accomplish more than people working by themselves is a well-established principle of social psychology" (p. 7). What he found in his research, however, was that children working cooperatively in the classroom resulted in increased social gains, such as race relations, and increased achievement of all members of the group. There are, however, two essential components to ensure increased achievement (Slavin, 1988). First, there must be a group goal which is important to the group; and second, there must be individual accountability.

The teacher is an integral part of cooperative learning, but in the new role of facilitator, which is a "definite shift in the role the teacher plays" (Watson & Rangel, 1989, p. 37). This shift can be a threat to many teachers who believe it is their responsibility to be the source of all knowledge in the classroom--the sage on the stage. By taking the responsibility upon themselves, teachers limit their students' opportunities to explore, try new experiences, fail, succeed, and grow. Students can become mentally lazy when they realize the teacher knows the one answer and in a matter of time that one answer will be revealed. When acting as a facilitator in a cooperative learning technology activity, the goal may be the same for the class, but each group of two to four students will pursue very different avenues and will learn a wide range of skills while working toward achieving the goal.

Teachers must be willing to learn from their students and become high level critical thinkers themselves (Collins, 1991, p. 9), but must also be cooperative learners, working with and learning from their colleagues. Peer coaching is a method of teacher helping teacher and teacher learning from teacher and is "perfectly adapted to the philosophy of the cooperative school" (Slavin, 1987, p. 12). In Joyce's

(1991) summation of the research on school improvement, he stated that most of the orientations relate to changing the culture of the school, and that change begins with collegial faculties using all resources at their disposal to develop a plan which will work in their school. Kieft (1988) suggested that middle level and high school technology teachers work cooperatively with elementary teachers to help infuse technology activities at the elementary level.

In a plan for implementing a science curriculum that embraces technology education (Loucks-Horsley, Kapitan, Carlson, Kuerbis, Clark, Nelle, Sachse, & Walton, 1990), the importance of inservice programs for teachers, administrators willing to allow teachers to experiment with alternative classroom environments and assessments, and raising community awareness and educating them as to the importance of these alternatives are continually stressed as important for a successful implementation. It is also suggested that an ongoing teacher support system be instituted, such as "peer coaching, where teachers work together to look at their successes and difficulties with the new instructional model" (p. 68). A quick-start strategy with two-year implementation is also offered. Components of the plan includes:

1. A shared leadership team of teachers and administrators to examine the current state of science teaching and act as monitors of the chosen implementation process.

2. Choosing an existing exemplary program to implement.

3. Choosing a set of pilot teachers to master the program over the course of a year.

4. A two-year training plan for all teachers and administrators which will include full-day workshops, training in cooperative learning, and release time to work with the pilot teachers in learning how to teach the program's units of study.

5. A support system ensuring the materials and supplies needed to support the program are available for the teachers.

6. An awareness program made available to other outside parties not actively involved in the classroom implementation (p. 151).

Thode (1989), in explaining the importance of technology education in Idaho schools, believed that experiences with technology should occur early in a child's schooling and should help train students to adapt to change brought about by "technological advancements" (p. 12). The goal of this program was to "extend, expand, and supplement ideas in humanities, sciences, and environmental exercises that are currently being explored in the normal classroom situation" (p. 13).

Kieft (1988) realized that many elementary schools cannot embrace a new curriculum called technology education and alternatives must be explored. Hutchinson and Hutchinson (1991) maintained that technology education at the elementary level should not be a new curriculum, but rather a focus on process. They believed five strategies were essential to ensure that this discipline of technology becomes a basic component of all kindergarten through grade 12 education.

> Content must be envisioned from a holistic rather than an industrial perspective; open-ended design activities must be presented in relevant contexts; new evaluation strategies will require enhanced documentation skills; technology activities must be designed to integrate learning from other subjects; and planned progression will provide all students a growing breadth and depth of understanding, critical to living responsibility in a high tech world. (Hutchinson & Hutchinson, 1991, p. 14)

Data Gathering Through Consultation with Others

The Director of Pupil Personnel Services strongly believed that reaching out to parents was critical to any career awareness or affirmative action initiative (Meys, 1991). He believed that educating parents about career opportunities and corresponding course requirements was the most critical link in getting students involved in non-traditional programs.

The two district computer teachers, who schedule and see all elementary students kindergarten through grade 6, analyzed student activity in the computer labs. They found that interest in the computer, mathematics software, and science software appears to wain between grades 4 and 6, the same time girls begin to struggle with their femininity and what will enhance and diminish that perception in the eyes of others. Those two teachers noted that of the wide-range of curriculum-based software used in the computer labs, boys and girls worked well on all software up to about grade 4. They would work together in groups of two, but typically chose to work with another of the same gender. The amount of excitement in the classroom was equal for the male and female groups regardless of the subject. There was a change beginning in grade 4 and obvious by my own observations in grade 6. Students still chose to work in same-gender groups, but the boys were obviously more involved with the software, overtly displaying their enjoyment and successes while the females seemed distracted and even bored with the software.

The software that had females most involved regardless of age was desktop publishing software where students had to prepare text and search for graphics to support their stories. This preference for graphic communications was also one of the topics grade 8 females chose as their favorite.

The point at which females began making stereotypic female choices appeared to be grade 5. There was some in grade 4, it was more clearly visible in grade 5, and very clear in grade 6. In interviews with the Supervisor of Special Projects and the Coordinator of District Programs, grade 5 was noted as the grade their observations showed gender-role stereotyping being overtly manifested. This stereotyping was clearly the case by grade 6. Horvath (1991) suggested that in order to change any attitudes related to mathematics, science, and technology, the initiatives had to be in the elementary schools with the children, their parents, and the teachers. She also felt that an awareness program at the elementary level would be more effective because her experience had shown that parents were still very interested in attending school functions and that interest subsided dramatically after grade 6.

Doran (1991) supported an evening program which would bring the children and their parents into the school to work together on technology-related projects. She believed a program modeled after the Family Math program (Thompson & Kreinberg, 1986) would be welcomed by the parents. Because Family Math was so popular, families had been closed out of the sessions every year. A new evening program dealing with technology would allow the parents another option and would also allow a specific age group to be targeted.

Another critical issue, which was evident by discussions with the four elementary school principals, was that the teachers were at their breaking point with pull-out programs and demands on their classroom time. Any initiatives which would mean one more burden in their already overburdened schedules might not meet with success. It might get polite lip service, but would not make an impact because it would not be actively supported. Any new initiative must enhance what teachers were already doing, not demand they do even more.

Proposal Solution Components

The manager targeted four basic strategies to successfully increase female enrollment in technology education. The key strategy, however, would be the completion of the $162,500 New Jersey State Grant entitled Teaching Essential Life Skills (TELS). This grant was designed to incorporate technology principles and proficiencies and career awareness into the curriculum of kindergarten through grade 6.

The first two strategies of the project would be to continue efforts to increase female enrollment at the high school and the intermediate school. Students would continue to be surveyed as to attitudes toward and awareness of technical careers, and awareness initiatives would be undertaken. At the intermediate school, students would continue to evaluate technology activities, and the curricular initiatives toward gender-neutral activities would be evaluated by both the students and technology teachers.

The next strategy involved completion of the requirements of the TELS grant, designed to implement technology education at the elementary level, over the 1991-1992 school year. The Request for Proposal (RFP) had been completed by the manager, the Director of Pupil Personnel Services, and the Director of Special Projects. There were eight grants to be awarded throughout the state, and Randolph Township was awarded one of the eight in the spring of 1991. The grant writers knew this grant would be a challenge because the components as well as the dollar amount were originally planned to cover a two year period. Due to political problems in our State capital, however, the time frame was compressed into 10 months (September 1991 through June 1992) with no reduction in the components or the dollars.

The structure of personnel for completing the grant was determined. Because the majority of the grant activities centered on technology learning activity development and implementation, the primary person responsible for working with the staff and developing the activities would be an elementary curriculum coordinator with experience in technology education. It was also determined that all four elementary schools would be involved on an equal basis due to parental complaints in the past regarding perceived special treatment of one school over another in programs and activities. There would be one teacher from each grade level, kindergarten through grade 6, from each of the four elementary schools, for a total of four teachers at each grade level district wide, on the curriculum development committee. An organizational chart was prepared to outline the personnel structure (see Appendix B). The manager was the TELS project director, responsible for the grant oversight and all financial components. The Director of Pupil Personnel Services would be a strong support and could participate in any and all activities, but was not required to do so. All developed grant guidance components would be approved by him and he would evaluate the grant guidance counselor not only because of his expertise, but because the guidance component of this grant would serve as the foundation for a district elementary guidance program which he would ultimately oversee. Throughout the grant time line, activities for kindergarten through grade 6 would be developed and implemented to foster and assist students in developing life skills necessary to function in an increasingly technological society. Female elementary teachers would be targeted to help break stereotypic models by making hands-on technology a gender neutral activity. All initiatives would be evaluated and, working with 1992-1993 budget constraints, plans for second-year activities would be developed.

The last strategy would be the development and implementation of a family technology evening program for elementary students and their parents. It would be based on the successfully implemented Family Math program being held at two of the elementary schools for students in grade 6. Family technology would target grade 5 students and would be offered during the spring of 1992 at a third elementary school.

Project Outcomes

The following objectives were planned to guide the project. Once the objectives were determined, actual planning began in July 1991, with implementation to begin that September.

Terminal objective 1. By June 1992, enrollment in grade 8 Junior Engineering would have maintained a minimum of 10% female enrollment.

Process objectives.

1.a. Based on the project findings, the grades 7 and 8 curriculum would be analyzed, revised, and implemented.

1.b. Students enrolled in Junior Engineering would be surveyed after each unit of study for feedback on their attitudes toward the unit and their suggestions for improvement.

1.c. The one-on-one meetings with the grades 7 and 8 guidance counselors would continue.

1.d. Continue to survey and work closely with females enrolled in Introduction to Technology to encourage their continuing in the program.

Terminal objective 2. By the end of scheduling for the 1992-1993 school year (April 1992), initial enrollment numbers would show a 20% female enrollment in the high school technology program.

Process objectives.

2.a. Females currently enrolled in high school technology courses would be surveyed for their feelings and suggestions on how to attract more female enrollment.

2.b. Special activities, such as student of the month to highlight student success, would be continued.

2.c. A special department newsletter would be prepared and distributed to tell students of course offerings prior to course selection for next school year.

2.d. Participation in guidance activities for parents and students, grades 7 through 12, would be continued.

2.e. One-on-one interventions with guidance counselors, grades 9 through 12, would be continued.

Terminal objective 3. By June 1992, elementary teachers on the TELS grant curriculum development committee would have implemented at least three technology-based lessons in their classes using cooperative learning, and at least one other teacher at each grade level would have field tested each lesson through peer coaching.

Process objectives.

3.a. The required personnel would have been hired to support required grant activities.

3.b. The Curriculum Development Committee, made up of elementary teachers from all four elementary schools, would be selected.

3.c. All committee members would complete inservice programs on technology education--what it is and how it can change the classroom.

3.d. The teachers on the Curriculum Development Committee would have training and incorporate cooperative learning in their technology learning activities.

3.e. Curriculum units would be developed through the Curriculum Development Committee. They would be based on existing curriculum themes and developed topic webs.

3.f. The curriculum units would be field tested by teachers participating on the Curriculum Development Committee and analyzed for effectiveness with students by evaluation form completion and interviews with children and teachers participating.

3.g. The teachers on the Curriculum Development Committee would have training and participate in peer coaching activities.

3.h. At least one other grade-level teacher would work with the Curriculum Development Committee participant to field test the revised version of the curriculum unit.

3.i. A final evaluation of curriculum units from all teachers and a cross section of their students would be collected.

3.j. Randolph Township Schools would co-sponsor, with seven other TELS grant recipients, a statewide conference for elementary teachers, counselors, and administrators.

3.k. Continued support for second-year implementation of the activities would be sought through continued staff development (based on financial status June 1992) and collegial and administrative support.

3.1. Continue to encourage development of new activities and set up feedback/dissemination procedures for new curricular units and successful activities.

Terminal Objective 4. By May 1992, develop and implement the family technology evening program for elementary students and their parents and have at least 10 families participate.

Process Objectives.

4.a. Develop a plan based on the successful Family Math program now offered with input from the program supervisor, the two program teachers and other technology teachers in district.

4.b. Design a publicity campaign to encourage participation.

4.c. Implement the planned program.

4.d. Analyze the participants completed evaluation forms for possible changes or enhancement to the program.

4.e. Plan the family technology program for the 1992-1993 school year based on analysis of participants and teachers evaluations.

Side Effects

The need for elementary level guidance counselors in the district has been expressed by the elementary principals and teachers for years. The TELS grant required us to hire a guidance counselor to work in the elementary schools. We knew from the beginning of this project that one guidance counselor would not be able to serve over 2,100 children in four schools, but this person could develop an elementary guidance program to be implemented for the 1992-1993 school year. It was hoped that through the recognition and initiatives of the TELS grant that elementary guidance counselors would not be cut from the 1992-1993 budget as in the past. If counselors were cut from the budget, the structure for an elementary guidance program developed through the grant would be ready for use in the future.

Peer coaching and cooperative learning would be implemented on a small scale through the grant. These initiatives could lead to valuable inservice opportunities for the entire district faculty in the future.

Developing technological activities through curricular themes and applying the problem solving model to all classroom activities could be presented by classroom teachers involved with the TELS project this year to other teachers in the future. Sharing stories of their successes with their peers and acting as resources for continuation of this effort should be seriously considered. Evaluation of resources needed for this effort should be studied by TELS personnel, TELS participants, principals, and central office administration and a plan developed to continue support and resources for this effort.

There is always a risk in embracing something new, and a possible problem may be the timing of evaluations principals prepare on their risk-taking teachers trying the new program. Classrooms of students involved in cooperative learning and problem solving are busy and noisy, yet proven to be productive. The principals must realize that a cooperative learning, hands-on classroom will look very different from the typical classroom model of desks in rows and quiet students busy at their individual task. There is no guarantee, however, that the principals would attend their inservice on what to look for in classes involved in technology learning activities or that they would appreciate the risk the teachers were taking in changing the mode of classroom instruction. If the teachers were evaluated negatively for their risk taking, the risk taking may cease for any new initiative.

Throughout this project the regular classroom teacher and students were targeted. The activities and the problem solving approach, however, may offer wonderful enhancement opportunities to special children. There has been some initial interest on the part of the special education teachers, but more could be done.

Chapter 5

Implementation History

Recapitulation of the Action Plan

There were three basic strategies on which all objectives were based in an effort to increase female enrollment in technology education. The first was to continue initiatives at the high school and the intermediate school including curriculum revision, one-on-one meetings with guidance staff to make them more aware of the value of technology education, and working with students to determine their interests and understanding of technology education (terminal objectives 1 and 2).

The second strategy was to complete all activities of the Teaching Essential Life Skills (TELS) grant designed to infuse technology education at the elementary grade levels (terminal objective 3). This project involved hiring two staff dedicated to grant activities, working with 28 elementary teachers throughout 1991-1992, and participating on the steering committee with the seven other TELS grant recipient school districts' representatives to plan and hold a statewide conference highlighting the TELS projects of all eight recipient schools.

The last strategy, a family technology evening program, would be planned and implemented for elementary students and their parents (terminal objective 4). This program would be designed to interest parents in technology education and encourage their children, particularly female children, to be more involved in mathematics, science, and technological areas of study.

Based on the review of research done on female participation in mathematics, science, and technology programs; the findings from surveys and interviews related to attitudes toward technology by students in grades 7 and 8; and the stagnant enrollment in the high school technology program, even after intensive initiatives in grades 7 and 8; it was determined that the most promising approach to increasing female enrollment in technology would be initiatives at the elementary level. Therefore, the primary emphasis and resources were spent on objectives related to elementary-level strategies. These strategies were not expected to pay immediate dividends in increased female enrollment, but rather represented the foundation for long-term growth.

Chronology of Implementation Activities

The activities of this project took place from May 1991 through December 1992. A preliminary project during the 1990-1991 school year provided the basic data upon which these objectives were based. Planning and preparation for the TELS grant activities took place during the summer of 1991, and planning for the extension of TELS activities with limited allocated resources took place during the summer of 1992. Although the objectives of this project are independent of each other in both staff utilization and types of activities, they all took place during the same time frame. They will be addressed separately for clarity.

Terminal objective 1. The first objective was to maintain 10% female enrollment in the eighth grade elective, Junior Engineering. This was to be achieved through curriculum evaluation and revision based on student surveys and one-on-one meetings with guidance counselors responsible for grade 8 scheduling.

The middle-level guidance staff, as well as students enrolled in Introduction to Technology, a nine-week cycle course taken by half the grade 7 students and half the grade 8 students each year, were interviewed throughout the 1990-1991 school year by the technology teachers and the manager regarding course content. Students and counselors were asked what they thought of Junior Engineering and would they take the course (students) or would they recommend the course (counselors). The technology teachers and the manager repeatedly heard the view expressed that the Junior Engineering course was simply a full year duplication of the content of the nine-week cycle course, Introduction to Technology. The content of Junior Engineering had been designed to be an intense study of technological processes which would allow students to expand and enrich the basic knowledge and skills gained in Introduction to Technology, but was not a duplication of topics. It was also not necessary to have taken Introduction to Technology to succeed in Junior Engineering.

The counselors and students were questioned further to determine why they believed Junior Engineering was a duplication of Introduction to Technology. The manager and the technology teachers reviewed the thoughts shared by the students and counselors and it was determined that the individual activities within broad categories covered in both classes, such as structures or transportation, needed to be as loosely related as possible. If students built a bridging structure, such as a span to reach between two tables, in Introduction to Technology, they felt the major bridge unit in Junior Engineering was the same and were choosing to take a different elective. We had hoped such connections would allow the building of knowledge and would excite the students enough to enroll in Junior Engineering. The curricular connections, however, were having exactly the opposite effect and had significant negative implications for the future of our program. A serious analysis of each activity at the middle level had to be undertaken and alternative activities found in some areas of the curriculum. The format of extensive documentation and research would be the same for any activity done in either Introduction to Technology or Junior Engineering, therefore, the type of activity done could be changed to be more appealing to a broader base of students while maintaining quality.

Students enrolled in Introduction to Technology during 1990-1991 were surveyed at the end of their nine-week cycle to determine general types of activities liked best. The technology teacher developed a form which listed all possible activities and each student would circle the activities completed. The form then asked one question: What was your favorite activity and why was that activity your favorite?

Approximately 280 students cycle through this course in one year, therefore, a broad picture of favorite activities could be developed. Each student was required to complete two activities of their choice. Only 11 students completed more than the two required activities. The information gathered (see Table 3) was analyzed as to the total number of students selecting the activity, which denoted interest in the area, and the percentage of students selecting each activity as their favorite. Each student could only pick one favorite activity of those he/she completed.

Table 3

Favorite Activity in Introduction to Technology, 1990-1991

Activity	n[a]		Favorite Activity	
	Female	Male	Female	Male
Designing with Structures	88	71	42%	34%
Control Technology (Lego/Logo)	43	64	9%	30%
Transportation Modeling				
Car	34	58	6%	17%
Air	53	49	9%	12%
Computer Graphics Presentation	76	55	34%	7%

[a] Total number of students completing the particular activity.

The results were rather unexpected in that the structures unit was the most popular with both girls and boys. Because of informal discussions with female students by the teachers and manager during class periods and the results of a random sample of females noting their favorite activities during the fall of 1990, we knew the girls enjoyed the structures activity. Although we knew the boys enjoyed the structures activities based on discussions with them by the teacher and the manager, we were surprised that it ranked first with the boys. It further reinforced our belief that doing a structures unit in both Junior Engineering and Introduction to Technology would attract students, as long as the units in the different classes were not too similar in nature (e.g., doing decks or playground structures in Introduction to Technology while doing bridge building in Junior Engineering).

The second most popular activity of the females, computer graphics, was the least favorite of the males. The second most popular activity of the males, control technology, was the least favorite of the females. This presented a dilemma, but also an opportunity to enrich both the males and females experiences by offering both these areas of study in Junior Engineering. It was determined that both these broad topics would be included in the Junior Engineering course. The computer graphics would take the form of CAD (computer-aided drafting) and would offer an extension of the drafting component of the course as well as introduce the students to the high school program which was heavily CAD oriented. Control technology would not rely on Lego/Logo, as in the Introduction to Technology course. Instead, students would study control and apply the principles to developing a child's toy with moving parts.

Considering all the information gathered and evaluated, both the Introduction to Technology and Junior Engineering course contents were thoroughly evaluated with some redesign in June 1991 for implementation in September 1991. The information gathered would help determine the sequencing of topics in the technology program, grades 7 through 12, to ensure no duplication of activities.

Only one change was made in the curriculum of Junior Engineering for September 1991. The transportation unit, where students designed and developed metric 500 race cars, was replaced with a unit on children's toys which incorporated simple machines concepts (control technology). The CAD options would not be offered in September 1991, and all other activities remained the same primarily because the teacher who had developed the program was being released from employment due to a reduction in force (RIF). The teacher replacing him had never taught technology education and was not familiar with the process orientation of the program. He had taught graphic arts in the industrial arts program, a product-oriented program. We were fortunate to be able to retain the original teacher as an employee of the TELS grant and his office was adjacent to the Junior Engineering room. As long as the curriculum remained largely unchanged from his last year teaching the course, he would be able to help the new teacher throughout the year with Junior Engineering. This was an effective strategy and the new teacher was able to effectively teach the curriculum using training he sought through professional development and through the valuable resource, the other teacher, being available almost daily. It did mean, however, that another look at the curriculum would be necessary at the end of the 1991-1992 school year to consider changes we believed would further enhance the program but which were postponed to allow the new teacher could get oriented.

Students taking Introduction to Technology during the 1991-1992 school year were asked to complete the same survey form indicating activities they completed, their favorite activity, and why it was their favorite. With minor percentage point changes, the results were the same as the year before and the ranking of favorite activities were identical.

During the 1991-1992 school year the new teacher of Junior Engineering made an evaluation of each unit of study a component of each student's documentation requirement. To properly prepare the documentation, each student was required to log daily progress, report research findings on the problem they are seeking to solve, support their problem solution based on research, prepare technical drawings of their problem solution, and analyze their own performance. As part of their own performance evaluation, students were now required to evaluate whether they enjoyed the activity, why they did or did not enjoy the activity, and what they would suggest for improving the activity.

The teacher and the manager reviewed the comments of the students and found 100% of all responses were positive toward the activities. The majority of the suggestions related to having more time to complete the activities. The information was only useful in that the activities being done were liked by the students. Since the students were obviously motivated toward these type of activities in having selected the course in the first place, we garnered no useful information from the responses.

During May 1992, the Junior Engineering curriculum was again examined by the middle-level teachers and the manager. Based on the grade 8 survey done in 1990 and concerns of the technology teachers, it was determined that the one component missing from the program was planned career awareness. The intermediate school technology teachers had implemented a few career awareness activities, but they wanted to examine the curriculum thoroughly and infuse more career awareness by sequencing activities around types of technical and engineering jobs, such as mechanical engineer. The resulting course of study (see Appendix C) made the course more sensitive to helping students understand technology-related career paths, primarily engineering. The activities done throughout the course emphasized the skills required of various careers, as well as how the careers were similar and how they were different. This course of study was implemented in September 1992.

Terminal Objective 2. It was planned that after scheduling for the 1992-1993 school year, the enrollment numbers for the high school technology program would show 20% female enrollment. The activities planned to accomplish this goal would take place only at the high school and would involve working closely with guidance counselors and female students currently enrolled in the technology program.

During the fall of the 1991-1992 school year, the manager spoke with each of the 16 girls enrolled in technology courses to determine why they took the course and their thoughts on how we could attract more females. The courses the girls chose are shown in Table 4. Twelve of the girls were in 9th grade students, three were 10th grade students, and one was in 11th grade.

The two girls enrolled in Junior Engineering in 1990-1991 selected Drafting and Design as a full-year elective in grade 9. They both said they enjoyed the drafting components of Junior Engineering and thought they would like to do more than they had been able to last year. This was encouraging because one purpose of Junior Engineering was to peak interest in a wide range of technical areas. It was effective with these girls.

Table 4

Females' Technology Courses of Choice for 1991-1992

Course Title	Number of Females
Technology and Design (basic first year course)	4
Drafting and Design: Level 1	10
Level 2	2

Seven other girls in Drafting and Design were students in grade 9. Their responses related to liking the drawing projects they did in Introduction to Technology, the teacher had encouraged them to continue taking technology courses, and their parents also encouraged them to continue with the program. The last girl in Drafting and Design was a student in grade 10. She had a friend who had taken the course last year, really enjoyed it, and had recommended the course to her. This girl had no real career goals, but was now thinking about architecture as a career because she enjoyed the course and her friend, continuing with Architecture (Level 2) this year, had highly recommended the advanced course. Seven of the 10 girls in Drafting and Design had at least one parent in a technical career.

One of the girls in Level 2 was in grade 10. She had shown talent for drafting in Drafting and Design and the teacher had encouraged her to continue. She really enjoyed drawing and said she loved designing houses and hoped to be an architect. The other girl in Level 2 was a grade 11 student planning on attending college to major in mechanical engineering. Her guidance counselor suggested she take at least one year of drafting. She enjoyed her first so much she decided to continue. She said another major factor was her first-year drafting teacher. She really liked him and he encouraged her because he said she had a special talent. This young lady did share with the manager that she had a friend who wanted to take drafting but was strongly discouraged by her counselor. The counselor told her it was not a course for young ladies and she would be the only girl with all boys. She felt this was not fair and the counselor should not discourage anyone from taking drafting.

The four girls enrolled in Technology and Design were all grade 9 students and none of them had taken Junior Engineering. Two of the girls said they enjoyed Introduction to Technology and wanted to take more of those courses. The other two said their parents wanted them to take it after having heard about the program at the presentation made by the manager at Eighth Grade Parents Night.

When the girls where asked how to attract more girls into the program, they had only one response--you have to tell people about the program. They unanimously believed that not enough was done to tell people about the courses, and because people do not know what is happening in the courses they do not take the courses. When asked about the course content, the girls believed the content was fine, it was lack of knowledge about technology that was keeping other girls out of the program. The responses from these girls were very similar to the responses from the girls enrolled and interviewed during 1990-1991.

By interviewing the girls enrolled, we had a picture of why a very few representatives of a larger population were involved in the technology program. The profiles of these girls tended to be similar: independent thinkers determined to take courses they wanted regardless of others trying to talk them into alternatives, parents with technical backgrounds, encouraged by technology teachers and parents to take the courses. The information from these girls didn't offer any new insights but reinforced what we already knew about female enrollees.

As the interviews were being done, the manager was informally sharing the information with the technology teachers. The teachers decided that over the same time period that I interviewed the girls they would speak with all the students in their classes to see if additional insights into the problem of low enrollment could be determined. The manager and the technology teachers met in December 1991 to combine the information and plan additional strategies prior to 1992-1993 student scheduling which would begin the third week in January 1992.

The teacher-student discussion method was certainly informal and exact numbers of students stating a particular problem cannot be identified exactly because of the discussion format used by the teachers. These sessions were designed to get a general feeling of the students' experiences and see if we needed more work in broad categories of public relations such as more information to parents, more work with counselors, etc. The teachers also encouraged students to see them individually if they would like to share something but not in front of the rest of the class. The comments offered no additional information except that at least one student in each class, with others in agreement, noted that their guidance counselor had tried to discourage them from taking the course. A group of four male students visited one technology teacher after school to discuss this same issue. They were concerned because they knew some of their friends did not take technology courses because their counselors scared them into thinking it would hurt their college acceptance. Students are very aware of programs disappearing from the offerings because of small numbers. This group was concerned because they wanted to continue taking technology courses and were afraid that they might not have the opportunity if enrollment did not increase.

As a result of the review of information collected from both the male and female students, it was determined that three of the six guidance counselors needed to be talked with again about the program. Their bias was clear in still perceiving the courses based on the teachers background and that females should be steered away from technical courses. It was also determined that our publicity must be continued. The technology program was highly visible, yet students were still saying that not enough was known about the program.

In January 1992, the manager met with the guidance department in a group meeting to talk about the program. Before the end of January the manager met with each counselor individually to talk about the technology program and our attempt to increase female enrollment. The talk with the three identified biased counselors was a little stronger in emphasizing the importance of these courses.

During 7 of the 10 months of school, the Technology Student and Business Student of the Month Recognition Program continued. At the end of September, October, November, January, February, March, and April the respective faculties would meet and decide on the student they would like to recognize based on specific criteria (see Appendix D). The students' names were publicized throughout the building and a morning reception was held prior to the start of the school day to personally recognize each student. The parents and guidance counselor for each student were invited, as well as building administrators and department faculty. From 7:00 to 7:30 a.m. the school personnel would congratulate and talk with the parents and the students. The students would be awarded a certificate with a short explanation for their selection. The department faculty have strongly supported this effort even through tough union negotiation ploys, and the feedback from parents and administrators in attendance has been very positive. The one disappointment continues to be that the invited guidance counselors have never attended. When asked, the answers typically have been they are too busy in the morning.

During January 1992, a departmental recruiting newsletter was prepared and distributed to all students in grades 9, 10, and 11. The newsletter (see Appendix E) highlighted each area in the department with encouragement to obtain more information and sign up for courses. Approximately 900 newsletters were distributed in the high school.

January 28, 1992 the annual Eighth Grade Parents Night was held at the high school. Approximately 210 parents were in attendance. Parents were split into four groups and they traveled to different locations to hear talks by each department supervisor. The manager made a 12 minute presentation to each group of parents and fielded questions at the reception held after all presentations were complete. On February 6, 1992, a presentation was given to all grade 8 students by the special area supervisors (music, art/home economics, business/technology). The students were divided into three groups and each group heard the same 20-minute presentation. Interest in the technology program seemed high, although enrollment numbers did not reflect the interest. The grade 9 required courses allow for selection of only one full-year elective and one semester elective. That structure prohibits much flexibility in course selection, however, the manager received feedback from parents and students that based on these informative sessions they have hoped to participate in the technology program in the future.

These types of informative public relations activities appear to have minimal effect on the enrollment numbers at this time, but enough parents and students informally comment on the publicity to make it worth continuing. In this manager's opinion, making an elective program high profile is critical to successful enrollment. Such continued initiatives increase the visibility of the program and contribute to the perceived program quality and benefit to students.

Terminal Objective 3. This objective was the primary initiative and involved planning, writing, and implementing the components of the Teaching Essential Life Skills (TELS) grant received from the State of New Jersey. The grant was designed to infuse technology education and career guidance activities into elementary classrooms. In the manager's opinion, this type of elementary-level intervention holds the greatest hope of increasing female enrollment in technology education in the future.

The Request for Proposal (RFP) was completed in May 1991, by the manager, the Director of Pupil Personnel Services, and the Director of

Special Projects. In June the board of education office was notified we were successful and would be awarded one of the eight TELS grants. The time frame for grant activities would be September 1991 through June 1992. In its original form the grant was designed to span two years. The first year activities would consist of training staff and planning for implementation. The second year would be the implementation and the culminating statewide conference. Due to uncertain upcoming political elections, the amount of money remained the same as did the required activities, but the time frame was reduced to 10 months.

The major tasks required to be completed were:

1. Identify a project director for grant oversight.

2. Employ a full-time elementary guidance counselor dedicated to grant activities.

3. Employ a full-time elementary curriculum coordinator dedicated to grant activities.

4. Hire technology education consultant/s to train selected staff on the principles of technology education.

5. Form a curriculum development committee to be made up of kindergarten through grade 6 teaching staff.

6. Present awareness sessions to district staff on the grant activities and inservice training on cooperative learning and peer coaching.

7. Develop and publish two district newsletters describing grant activities and disseminate to all New Jersey elementary school districts.

8. Develop curriculum packets integrating the National Career Development Guidelines and the Technology Education Proficiencies into three language arts and three mathematics lessons at each grade level, kindergarten through grade 6.

9. Develop a packet describing the elementary counseling activities.

10. Develop a system of individual career plans for all kindergarten through grade 6 students.

11. Develop and implement a minimum of three activities for an at risk population at the elementary level.

12. Develop and implement four additional career activities, determined locally to focus on gender equity.

13. Co-sponsor and conduct one statewide conference for elementary teachers, counselors, and administrators regarding the TELS grant.

The job descriptions for the two grant positions (see Appendix F), the elementary curriculum coordinator and the elementary guidance counselor, were developed in May 1991, by the manager and the Director of Pupil Personnel Services respectively. Advertisements for the positions were posted in district and listed in the New Jersey Star Ledger in June 1991. The manager screened the applications for the curriculum position. The technology teacher who received notification of lay off through reduction in force was the only candidate with experience in technology education. This characteristic was determined to be critical due to the tight time line for implementation in the classroom of the required grant activities. The person working with the classroom teachers, in this case the elementary curriculum coordinator, should be fluent with the concepts of technology education, have a clear understanding of the implementation procedures, and be able to solve implementation problems as they arise in the classroom. Only a person experienced with technology education would have the depth of understanding necessary to make successful classroom implementation more likely in a short time frame. This particular candidate received his masters degree in administration and supervision in May 1991, so he also had training in management and aspired to an educational leadership role within a school district. He was selected as the candidate of choice, was approved by the Superintendent and Board of Education in August 1991, and was put under contract as the Elementary Curriculum Coordinator for the TELS grant effective September 1, 1991.

The Director of Pupil Personnel Services selected three finalists for the elementary guidance counselor position from the six applications received. The interviews where held in July 1991, and the candidate selected was chosen for her elementary experience and her ability to design new program ideas, which would be required for the position. Her contract was also effective September 1, 1991.

Although the manager was responsible for completion of all grant requirements including the guidance component, the guidance activities were delegated to the Director of Pupil Personnel Services. The manager met with him twice a month, more if needed, to be appraised of progress. The director would have the elementary guidance counselor meet with the manager for feedback on developed activities and suggestions on how to proceed prior to final completion of any products. Although the guidance and technology activities were taking place simultaneously, the guidance activities will not be addressed specifically in this document. The guidance counselor's projects were primarily system planning at the district level. The activities which were to be done with children were conducted as short term pull-out programs for 8 to 12 children at each elementary school. The gender equity units developed were tested with the classes of two volunteer teachers (both working on their masters degrees in guidance) in one of the four schools.

The New Jersey Program Specialist overseeing the grant called the first meeting to clearly define financial and program procedures for the year on September 5, 1991, and all grant recipient schools respective representatives (the project director, curriculum coordinator, and guidance counselor from each school) were required to attend. It was determined at this meeting that representatives from the eight schools would meet monthly to plan the required culminating conference as well as share information on their program implementation progress.

The primary component of this objective was formation of the curriculum development committee. Members of this committee would be the teachers with whom we would work closely to achieve success in implementing the grant activities.

During the beginning of September 1991, the manager met with each elementary principal to explain the grant and request a time to meet with their staff to explain the project and solicit volunteers to participate as members of the curriculum development committee. Staff meetings were held as planned throughout September 1991. At each meeting teachers were introduced to the project team (project director, elementary curriculum coordinator, and elementary guidance counselor), had the grant project thoroughly explained, and were asked to volunteer to participate. They could call the manager or curriculum coordinator for more information prior to making their decision. No calls were received.

Each principal was asked to encourage members of his or her staff to participate who would help us succeed. It was required that each elementary school have a representative at each grade. Due to the time restrictions, however, each principal had to develop a final list of participants by the first week of October 1991. This would mean, of course, that not all our participants would be true volunteers, some would have been assigned by their principal.

The final lists of teacher participants were received from the principals by the end of the first week in October 1991. Memos were sent to each teacher thanking them for participating and outlining the upcoming inservice training.

The teacher training was held the second week of October 1991. Two full-day training sessions were planned for each grade level grouping. Kindergarten through grade 2 would meet together for their two days of training and the teachers representing grades 4 through 6 would meet together for their two days of training. The consultants were contracted for a total of four days, repeating their presentation two times, once for each grouping.

The consultants selected were known to the manager, the curriculum coordinator, and the manager's departmental technology staff through the Technology Education Association of New Jersey and the many courses and workshops taken by the technology staff. The consultant scheduled to begin the two day sequence was a very motivational speaker. He was a college professor from a local state college with extensive experience in presenting exciting introductions to the concepts of technology education. The second training was done by a team very knowledgeable in elementary-level technology education and how to implement technology learning activities in the classroom. They offered possible classroom projects and gave the teachers an opportunity to try some simple activities.

The last hour of the second training day was set aside for teachers to express their concerns. This hour was designed to be a positive interchange between the teachers and the consultants, who were very familiar with problems elementary teachers across the nation have experienced and the solutions that were successful. This hour was also designed to let the staff vent any hard feelings they had about being volunteered by their principals, yet recognize that they would be committed to this project for the year. Because some of the teachers had been assigned, we believed it would be advantageous to allow them time to express their feelings and time for us to assure them they would be supported in a most positive, nonthreatening way.

This concept of "venting" time was discussed by the project team, and it was determined that the manager would deal with all the negative responses from the teachers. Because the curriculum coordinator had to work closely with these teachers all year, we decided it was better for him to be viewed as their peer, pulling for them with no evaluative authority in district, rather than the "bad guy," the person demanding the teachers start producing. The kindergarten through grade 2 hour went basically as planned. Some of the teachers felt put upon because they did not volunteer, rather the principal told them they would participate. They felt that having their grade level peers working with them was a help and also felt that the concepts of technology education were not totally new and of value for the children.

The hour for the grades 3 through 6 staff, however, was very different than planned and very negative. The hour began with the teachers verbally attacking the grant staff and challenging the value of one more new project. After about 10 minutes of this very negative interchange, the discussion was stopped and order brought to the session.

A brainstorming session followed and, as the teachers expressed their concerns, a listing was made on a flip chart. The concerns were discussed, and after analysis of the thoughts behind each concern, they were categorized into a resulting list of four basic concerns. First, three very vocal staff had volunteered and were now upset that they had to participate all year rather than just attend two training sessions. They felt they were not properly informed. Since the manager had told them at their respective staff meetings of the exact expectations and commitment, and they were also told to call one of the grant staff for more information prior to volunteering, it was not clear what else could have been done. Either way, these staff were trained and committed to the year project.

Second, there were concerns that the teachers would be evaluated by their principals too soon and not given time to develop their abilities with the new strategies. The manager addressed this by promising to meet again with each building principal to specifically ask them not to visit classrooms during a TELS activity for the purpose of evaluation. The teachers were told, however, that they should expect their principals to be interested in the activities. They could expect their principals to be asking about the progress and hoping for a chance to see an activity in action. The principals would be learning about technology education just as the teachers would be learning.

Third, there were people concerned about having the continued support they would need in order to develop the skills required to teach technology learning activities. In addition, they felt they did not have the materials to do the activities in class and they would not be able to get the materials. There was also concern that storage space was so scarce that they would not be able to store either their materials or the student projects. The manager addressed the issue of support and the purchase and storage of materials for technology activities. It was reinforced that they would have ongoing support in their efforts at the classroom level. The curriculum coordinator would be there to work with the teachers at the classroom level on request, and he was not authorized in any way to evaluate or report to the people who do the evaluations. The grant budget would allow the purchase of whatever materials and storage cabinets they would need. Purchases which could be made through the grant would be discussed more thoroughly at the next meeting.

The last concern, and the most serious concern, was that this activity was going to be just one more new activity in a long list of activities they are expected to accomplish in their classroom. The teachers said that their principals expected them to be at certain pages within the different textbooks by certain dates and the addition a new component would jeopardize their evaluations. They were also concerned that the worksheets that they are required to have their students complete for various subjects would not get done. Because the worksheets proved to parents and the principal that teachers were teaching and students were learning, not doing the worksheets could negatively impact their evaluations.

The issue of being at certain pages in textbooks by certain dates would be discussed by the manager with the Assistant Superintendent for Curriculum and Instruction. Clarification and guidelines, if necessary, would be obtained to ensure such established procedures would not hinder their evaluations or their participation in this project. The teachers were told that by our next meeting, coming up in November 1991, the manager would have answers for them on these concerns.

The project team had already determined that large group meetings would be avoided in the future. The project team would prefer grade-level group meetings because they would better serve the purpose of the grant, allowing the team to work more intimately and intensely with the teachers on the activities to be completed. There seemed little to be gained by large group meetings, and there appeared to be about five teachers who would rather spend the time instigating others to dissatisfaction rather than attempt to pull together to get the project underway. During the large group session we used a slogan designed to represent the need to pull together, work together, and share to get this project done--"All of us are smarter than any one of us." This was used in response to one woman who had many reasons and excuses as to why this project should be dropped and why it could not be done. The manager told her, and the group, that we needed to look at possibilities rather than dwell on limitations. The slogan was used all year as a reminder of the value of working together.

During the next week a post workshop questionnaire was sent to each of the 28 teachers (see Appendix G) and could be completed and returned anonymously. The purpose of the questionnaire was to clarify the project goals and allow more input from the teachers. The questions asked on the questionnaire were in three areas. First, this format would allow less vocal teachers the opportunity to express their concerns, if not already addressed. Second, to allow teachers some control over their participation by letting them offer suggestions on meeting days and times and initial suggestions on the purchase of supplies and equipment. Third, questions were phrased to challenge teachers to begin thinking about the learning activities that had to be developed in terms of extensions of activities they were already doing in their classrooms. Even if the teachers offered no activity suggestions at this time, they would have the basis to begin thinking about types of activities that could be developed into technology activities. This questionnaire was returned by 18 of the 28 teachers. All 18 forms were incomplete, with each teacher choosing to complete only parts of the form. Thirteen respondents signed their name to their questionnaire.

There were no additional concerns expressed, although five teachers reiterated their concerns about the impact this project would have on their classroom evaluations and four other teachers were concerned about not having enough supplies or storage. All 18 teachers offered their suggestions for meeting times. They all preferred half-day inservice meetings. Eight teachers made the comment that if it appeared they would be missing too much time with their students as a result of needed meetings, they would be willing to meet after school on occasion. The questionnaire suggested holiday or Saturday paid meetings and all respondents opposed this option. Regarding input on purchases, 8 teachers noted they needed storage cabinets for their classrooms and 13 said they would need money for supplies in order to carry out activities.

Eleven teachers responded to the questions related to activity development, and each of these teachers had signed their name to the questionnaire. They noted areas within their curriculum which might be enhanced by a technology activity. During the next two weeks the curriculum coordinator responded to each of these teachers personally to follow up on their ideas.

The manager met with the Assistant Superintendent for Curriculum and Instruction the week after the large group inservice sessions to present the concerns vocalized by staff and to arrange a meeting with the elementary principals. The manager also wanted some information on the individual teachers we would be working with on this project to determine areas of greatest strength and areas of greatest weakness. It had been obvious when the teachers were complaining that two people were overt instigators and two others were very hostile, refusing to even consider alternatives to make the project successful. More insight into these individuals would make it possible to find a way to work with them or to work around them.

The Assistant Superintendent had been in district 18 years and knew 26 of the participating teachers well. She knew the two non-tenure teachers, but only by reviewing their files. She was a valuable source of information related to the background needed to work effectively with the teachers. After reviewing the list of participants, she believed the 28 teachers composing the Curriculum Development Committee were basically a cross-section of the faculty in the district and would be a challenge to work with effectively. Of the 28 teachers on the committee there were 2 nontenure teachers, 1 of which was a first-year teacher; 4 teachers with reputations for excellence in the classroom; 10 were considered good, solid teachers who would challenge and question innovations yet would be willing to implement changes in their classrooms; 4 teachers were considered good teachers, but would probably not do anything different from what they had been doing for years unless we found unique motivation; 2 teachers were having trouble in their classrooms but were considered malleable; 5 were considered adequate but were negative about their work, negative about new ideas, had never participated in any building level or district level committees or training sessions, and were perceived by their principals as simply looking for easy ways to get through their days; and 1 was considered a poor teacher with no desire to improve, as evidenced by evaluations by the two principals she had worked for in the district during her tenure.

The information gathered by meeting with the assistant superintendent was also helpful in dispelling what turned out to be primarily weak excuses on the part of some of the teachers. There were no requirements related to being on certain pages in certain textbooks by specific dates and the principals had been told in the past they should not follow such a procedure. The issue with worksheets was also untrue, in fact there had recently been parent complaints through the Parent/Teacher Organization (PTO) Council, representing all four elementary schools, that too many worksheets were used and not enough creative teaching alternatives were being considered. There was a mandate from the Assistant Superintendent for the 1991-1992 school year that less worksheets be done in class since the more indirect encouragement to desist had not worked in the previous school year. The principals were told to strongly reinforce with their teachers that the teachers should be doing less with worksheets and more with hands on, creative activities including more extensive use of the computer labs found in each elementary school.

A special meeting with the elementary principals was held October 24, 1991, to discuss the TELS grant. This meeting allowed the manager to speak with the principals about the concepts behind technology education, important if they were to understand the tasks their teachers would be involved with inside their classrooms. The principals had been invited to the training workshops but had not attended. They did not understand the skills and approaches to curriculum we were asking their teachers to develop. Other issues covered included the requirements of the grant and the teachers' responsibilities. The teachers' concerns were highlighted and the issue of observation evaluations too soon on TELS activities was discussed. The principals agreed to refrain from evaluating teachers on TELS. They also expressed interest in the interdisciplinary concepts and hands-on aspects of the activities their teachers would be working on throughout the year.

The next meetings with the teachers were in small grade-level groups. The teachers had noted on the post workshop questionnaires that they would prefer to work with their grade level peers in half-day sessions. The manager and the curriculum coordinator scheduled and held the meetings, with the manager leading the discussion. The curriculum coordinator would be instrumental in the discussion when it turned to developing technology learning activities. On November 13, 1991, the grade 1 and kindergarten teachers met in the morning for half a day and the grade 2 teachers met that afternoon. On November 20, 1991, grade 5 teachers met in the morning, grade 6 teachers in the afternoon; and on November 21, 1991, grade 3 teachers met in the morning and grade 4 teachers in the afternoon.

Each meeting began with a recapitulation of the concerns and the results of the manager's meetings with the assistant superintendent and the principals. After this review of issues, the most vocal teachers became very quiet and appeared to be working with us but were not participating vocally. We hoped this was the end of the problems related to their perception that they were being overburdened through participation. For the remainder of the meeting mathematics and language arts technology learning activities were developed based on existing thematic curricular units and existing projects done by the teachers. Not having to develop totally new material relieved the teachers of some of the burden they had anticipated. We were asking that they just rethink and then change the process and procedures used in the units they already were teaching. Each grade level had to develop six (three mathematics, three language arts) technology learning activities, known as TLAs, by the end of April 1992, for a total of 42 activities. Each grade level developed at least one rough draft of a TLA at this meeting using special TLA lesson planning forms developed by the curriculum coordinator.

At the end of each meeting teachers were told that the curriculum coordinator would be around to see them over the next few weeks. They were encouraged to share their ideas with the him, and he was there to help them write the lesson plans and to help them carry out the activities in the classroom. If they were to call the curriculum coordinator, he would be there as soon as possible, but within one day. His on-call status had been discussed by the project team and seemed the only way to ensure the teachers would make the effort to contact him. The next series of half-day inservice meetings were scheduled for the third week of January 1992.

The original agenda for the November 1991 meeting included a presentation of the peer coaching component of the grant. As the meeting unfolded, however, the manager decided to reevaluate the peer coaching aspect of the grant and not bring it up at this time. It was clear to the manager and the curriculum coordinator that the teachers still did not have a solid grasp of either developing or implementing TLAs. Expecting them to develop TLAs, try them with their own students, act as peer coach to one other teacher at their grade level, and have that teacher field test the activity was idealistic in the time frame of less than one year. First and foremost, the teachers remained unsure of the TLA development process and the group work processes required of TLA classroom implementation. We determined it would be counterproductive to expect they would train another teacher before they were completely trained and confident themselves. In addition, teachers at each grade level progress through the curriculum at about the same pace. The teacher developing the activity would do the activity with their own students during the appropriate point in the curriculum, but taking time from another teacher's class at a later date to field test the revised TLA would mean that teacher could get behind in their content coverage. In addition, the TLA would not be supporting the curriculum, but would be an isolated activity. The project team determined that the only way the teachers would ultimately be actively involved in this project would be to prove that the developed activities strongly supported the curriculum and offered more effective methods of teaching. Forcing teachers to do TLAs as isolated activities rather than integral, supporting components of their curriculum would be contrary to the curriculum support philosophy the project team had espoused. It was more important at this time to develop rapport with the teachers participating, supporting them through their time of learning, rather than demand they be involved in additional, very time consuming responsibilities. The project team agreed that by deleting the peer coaching expectation, the curriculum coordinator could spend more time with our 28 teachers, increasing the chances of project success.

The cooperative learning component was discussed at the November 1991 meetings. Again, however, the project team felt it would be counterproductive to demand the 28 teachers learn and implement cooperative learning strategies. In addition, the district had begun a two-year objective for implementing cooperative learning. The cooperative learning requirement was, therefore, omitted from our implementation plan. One of the members of the Curriculum Development Committee was actively involved in the cooperative learning district plan and he shared information with his grade-level group. There were four other members of the Curriculum Development Committee already using cooperative learning in their classrooms and they shared their experiences with their groups. For the grade levels not having members knowledgeable in cooperative learning strategies, the manager presented some basics which would allow the teachers to more effectively use group work as required by most of the TLAs.

The November 1991 meetings were followed up by memos to each teacher thanking them for the input that day and a recapitulation of what was accomplished. The curriculum coordinator had taken the rough draft lessons that were developed and completed them. They were typed and attached to the memos. The teachers were encouraged to try them in their classrooms and to involve the curriculum coordinator.

During December 1991, five teachers called the curriculum coordinator to work with them on implementing technology learning activities (TLAs) in their classes. The curriculum coordinator worked with each teacher and shared the information on classroom results with the manager. The first activity to be completed in a classroom was finished by the third week in December 1991, just prior to the winter recess. The teachers and each student completed a post-activity evaluation. The teacher's form was designed to be a reflective instrument used to improve the next activity they would do. The students were asked if they liked the activity and what they learned. The information was used by the teacher to determine depth of thinking and also to reinforce the fact that the students preferred learning in a more active environment. We asked that the information on the completed forms be shared with the curriculum coordinator; but, because of the evaluative nature of the forms and the problems we were having with teachers fearing evaluation during this learning phase, the teachers retained the copies.

After a teacher completed a TLA with his/her students, the manager sent a personalize memo to the teacher (see Appendix H) with a copy to his/her principal. These memos were designed to be supportive of the teachers efforts and to motivate them toward continued participation.

During December 1991 and January 1992 the teachers still disgruntled about having to continue their participation with the project made their move with the teacher's union. The Elementary District Caucus was initially designed for teacher representatives from all four elementary schools to meet and discuss issues of concern in their buildings. The best plan of action to resolve the issue would be decided and that plan would be implemented. The Caucus, however, had a poor reputation with the teachers union in general and even with the people they supposedly represented. According to the assistant superintendent and four teachers who confided in the manager, it had turned into a forum for petty complaints from a very few teachers. The building principals were by-passed in this process when most of the issues raised could most effectively be resolved at the building level. The issues typically related to scheduling at one school, concerns over how parent conferences were conducted at another school, and other such building-level issues. Rather than attempt to resolve the issues, the complaints were published in the Association's monthly newsletter, distributed district wide to all employees, in what appeared to be an attempt to prove how the administration was insensitive toward the teachers. This newsletter, however, was often the first time complaints were made known to the elementary administrator best in the position to resolve the issues raised (Donnelly, 1991).

In the December 1991 issue of the Association's newsletter it was stated:

> Teachers feel that they are spending too much time away from their classrooms attending TELS meetings. They feel that there is little motivation or direction being shown from the leaders, and teachers are questioning the validity of the TELS program. This is an issue which needs immediate attention. (Stuelpner, 1991, p. 2).

The association president had met with the curriculum coordinator and the manager twice in November 1991 about letters she had received regarding the TELS project. The grant project had been thoroughly explained to her and she had returned the letters stating their accusations were unfounded. Since the people complaining the loudest had actually volunteered, she saw little basis for the complaints. After hearing the support the teachers were being given and the techniques used to work with the them, she was completely satisfied and the complaints went no further within the grievance process.

When the newsletter was distributed in December 1991, the manager requested a meeting with the association president. It was presented to her that this was a personal attack on the curriculum coordinator who was working very closely with the teachers, giving them all the support he could, and encouraging them to move forward during informal visits. It was also made clear that such tactics were unprofessional, that it represented an attack against the teachers who were working hard to make this project successful, and that by allowing such lies to be printed in a forum distributed so widely, the truth would not be known without the association's help. She said she was in agreement and that she would address the situation.

After the distribution of the newsletter, the manager received a letter signed by three of the teachers on the Curriculum Development Committee condemning the statements in the newsletter and offering their continued support of both the project and the leadership. They had sent copies to the superintendent of schools, the association president, and the curriculum coordinator. The curriculum coordinator received five phone calls from others on the committee expressing their support for his efforts. The association president had received three letters also most positive about the TELS project.

In the January 1992 issue of the newsletter the following appeared:

> In our December UPDATE, the leadership of TELS was unjustly and unfairly criticized in the report submitted by District Caucus. Even though the TELS grant has been demanding and time-consuming, direction and motivation have been provided by the organizers of this program. Our sincere apologies to those who were offended. Nevertheless, that is not to say there haven't been valid criticisms about the implementation of the grant, and we have spoken with the Project Director in an effort to reduce some of the conflicts. Let me know if things have gotten any better.
>
> We must be extremely cautious with our "constructive" criticism. It is important that we can substantiate the information. (Wauters, 1992, p. 1)

The next inservice meetings were held January 22, 23, and 28, 1992, in the same half-day format used in November, with each grade level meeting together for three and one-half hours. The manager and curriculum coordinator planned the meetings and it was determined that the manager would begin by reviewing the union problems and the truth behind some of the stories that were spread. The manager felt it was also time to explain herself to these people in terms of leadership style, assumptions about professional staff, expectations of professional staff, and how these things related to the TELS project. The teachers were willing to share some of their thoughts about the newsletter incident. They felt it was not only unfair to the leadership, but they also felt they had been attacked. Upon reflection, this entire negative incident was very effective in solidifying the support of the teachers who had not made up their minds if they would participate fully. The manager noticed a significant difference in the effort and the level of professional behavior demonstrated after her talk and some sharing on the part of the teachers. There were no further problems or meetings with the teacher's union representatives; and, although we had expected actual participation by about half the 28 Curriculum Development Committee members, 22 of the teachers worked with the curriculum coordinator to either develop and implement or simply try a developed activity with their children.

The remainder of each meeting during January was spent reviewing the final format for the TLAs, initially prepared by the curriculum coordinator, but changed through teacher input to be more effective for actual use in the classroom. There was also honest discussion regarding a less than clear understanding some still had of how to develop TLAs. The teachers who believed they understood shared their views and a few case situations were used to further clarify. At this juncture we also reviewed how many TLAs we had at each grade level and the category, either mathematics or language arts. It was determined how many in each category remained to be developed. Time was spent developing the concepts for the missing TLAs and teachers volunteered to more fully develop the TLAs either with the help of the curriculum coordinator or on their own. The next series of meetings would be in about two months and at that time most of the TLAs should have been completed.

Gender equity was discussed for the first time at the January 1992 meetings. The teachers were presented with information about the career choices their female students were making in later years and how they could greatly contribute to opening more technical options to their students by supporting their female students in these technological activities in the classroom. The issue of the importance of role models was discussed and the women teachers were asked to be aware that their female students would take their lead in liking or disliking these types of activities. Subtle stereotyping was discussed and teacher awareness was heightened toward this issue. With the exception of 2 teachers actively involved in gender issues, the other 26 teachers were surprised by the examples given of types of subtle stereotypic reinforcement that can happen in the classroom. Although more could be done in this area, getting these teachers to successfully complete the minimum grant requirements took more time than anticipated and these other components were not required or verified as happening in the classroom.

The culminating conference was also discussed at the January meetings. The basic conference format was presented and teachers were asked to begin saving all their students' projects and documentation for presentation at the conference. They were also asked to consider copresenting a workshop with the curriculum coordinator showing their TLA artifacts. There was no need to make a commitment at this point and they could discuss this possibility with the curriculum coordinator as he visited them during the next month.

The last half-day inservice meetings were held March 26, 31, and April 1, 1992. Grade-level packets of all written TLAs were prepared and each teacher received their grade-level packet. These documents would be examined for the last time at this meeting prior to being printed for distribution at the statewide conference in May 1992. This was the last chance for each grade level group to polish their contribution.

At this point all grades except grades 1 and 4 had at least the minimum number of TLAs developed. For those grades the missing TLAs were developed during their respective meetings. For the remaining grades a review of the latest implementations were offered by the those teachers involved. With the exception of kindergarten, each grade level had at least one TLA which had not been tried in the classroom. Time was spent looking at those TLAs and making them as complete as possible, knowing that they would not actually be implemented this year.

The culminating conference was again discussed. Artifacts had been collected by the curriculum coordinator and teachers were thanked for their contributions. Four teachers had been approached by the curriculum coordinator to help present one of the workshops and they had accepted. At these meetings three other teachers volunteered and had artifacts to support their contribution. Teachers not actually presenting were offered the opportunity to attend the conference. Of the other 21 teachers not presenting, 7 additional teachers planned to attend the conference.

After this last series of meetings, the curriculum coordinator met with individual teachers to finalize the TLAs which still needed some refinement. By the end of April there were 46 TLAs developed, 11 of which had not been tried in the classroom.

The final published document, to be distributed at the statewide conference, was a book designed as a turnkey packet for elementary technology education and career guidance (Randolph Township Schools, 1992). The TLA format developed by the teachers and used as the format for all developed TLAs (see Appendix I) made the document a valuable resource because the TLAs were clearly stated and easy to implement. As a result of the quality of this book, 10 of our teachers attending the conference personally spoke with the manager about the feeling of success they had and that they wanted to find a way to continue this project for the 1992-1993 school year.

One component of this objective related to the evaluation of classroom implementation of the technology learning activities (TLA). The TLAs were developed around themes covered at each grade level or around books which were required reading at each grade level. Because of the initial resistance to this project and the union interventions, the evaluations that were to be done, collected, and collated for interest on the part of the students and effectiveness in having students learn the required curriculum h[illegible]o be changed. Nothing would be collected to ensure no evaluation criteria would be applied to the teacher. The teacher's form was a reflective instrument designed for the teacher to improve their next activity. The students were asked if they liked the activity and what they learned. For the younger children, the information was gather verbally.

The curriculum coordinator was able to gather some information from these evaluations, but we were unable to use them for the purpose of gathering data on lesson effectiveness because we could not require the forms be completed and the forms were not completed consistently. The curriculum coordinator had eight teachers share the student evaluation information with him. These eight teachers were very motivated and enjoyed developing and implementing the activities. Their students reflected the same enthusiasm. Most of the comments the students made were that they would like to do more technology activities. Aside from giving the teachers student feelings about how learning can be more fun and still be a valued learning activity, therefore justifying doing TLAs in the classroom, these evaluative reports were of little value. The teachers most diligent about doing the evaluations were also the teachers who regularly challenged their students and attempted to make the classroom a exciting place to learn.

The curriculum coordinator worked with 14 of the 28 teachers in the classroom during a TLA. He modeled the facilitator role the teacher should play during such activities, meeting with the teacher later to review how the activity progressed and limitations that could be set to better control the activity. He would also share the questioning techniques most effective to facilitate the action and cooperative learning strategies which might enhance the TLA.

The eight TELS grant recipient schools worked together to co-sponsor a statewide conference highlighting the results of the year's grant activities in each school. At the meeting held September 5, 1991, by the New Jersey Program Specialist overseeing the TELS grant, it was determined that the representatives of the eight schools who received TELS grants would meet together at a central location on September 23, 1991, to begin planning for the conference and to share information on start-up problems and successes. The project director, curriculum coordinator, and guidance counselor from each of the eight schools attended the meeting held at Lawrence High School, centrally located just north of Trenton, New Jersey. At this meeting the representatives from each school shared their grant specifications, outlined how they chose their curriculum development committees, how they were presenting technology education to their teachers, and other logistics of their grant. Only two of the eight schools had representatives with a strong understanding of technology education, one was located in southern New Jersey, the other was Randolph, located in northern New Jersey. We agreed to help the other six school's representatives if they felt they needed any assistance.

Meetings were held, again at Lawrence High School, October 21, November 14, and December 4, 1991. These meetings dealt primarily with sharing information about our successes and failures in getting our respective projects going in our districts. Suggestions were offered on overcoming some of the problems. The conference was also discussed at each meeting. During the October 1991 meeting, it was determined that the only effective way to plan and carry out a statewide conference would be to pool the funds which were required to be spent on the conference and hire a consultant. The tasks of planning, organizing, advertising, and holding such a conference were too many and too time consuming to be taken on by the individuals trying to complete the other grant requirements.

During the November 1991 meeting, the bid specifications for the conference coordinator were drawn up and Lawrence Township Board of Education was selected to be the fiscal agent for the eight TELS grant recipient schools. During the month of January 1992, the necessary paperwork was completed by each school's Board of Education to authorize Lawrence to act on our behalf in collecting and disseminating funds for the conference.

During the December 1991 meeting, the bids were thoroughly reviewed and the consultant was selected through simple majority vote of the TELS representatives present (each of the eight schools had at least two representatives). The fiscal agent was notified of the choice made by the group and the selected consultant was notified of the next meeting, January 10, 1992, at which time she would meet the representatives from each school.

Prior to the January 1992 meeting, the consultant had called each project director and had faxed an agenda for the meeting. At the meeting we were introduced to the consultant. Some of the participants knew her because she had coordinated a number of conferences in the state over the last four years. It was determined that the conference would be held in a hotel rather than at a centrally located community college as had been discussed. All eight schools were concerned that we would not attract much attention or much of an audience, therefore, using hotel facilities might not be worth the expense. Upon further discussion, however, it was determined that we would spend the money on quality. We would need 50 paid registrants to break evenly financially, but we could have no gratis guests had been hoped. Although half of the cost would be subsidized through the grants of all eight school districts, less than 50 attendees would mean additional contributions by the eight schools. The TELS representatives in attendance were doubtful we would attract even 50 people because the conference was during the same four-week period as a major technology education conference and a statewide guidance counselor's conference, both of which had a history of drawing the audience we needed to target. Since school districts have experienced a shortage of funds over the last two years, the representatives of the eight TELS schools believed teachers from around the state would have to choose between the various conferences, and we believed they would not choose TELS primarily because they did not know the purpose of the grant or how it related to them. The TELS representatives agreed that in the newsletters each TELS school was required to prepare and mail to all elementary districts in New Jersey, the conference would be prominently advertised. The consultant prepared a one-page advertisement to be distributed at every conference held in New Jersey between March and May 1992.

The February 4, 1992, meeting was held at the New Brunswick Hyatt, the hotel the consultant had selected with faxed approval from all eight schools. Final decisions were made on all aspects of the hotel accommodations and food. The conference brochure with the registration form (see Appendix J) was also given one final review and was approved for printing.

At the March 4 and April 28, 1992, meetings final decisions on the keynote speaker, public relations, and the conference schedule and format were decided. The consultant prepared a press release describing the conference and it was approved at the March 1992 meeting. The press release was mailed in March 1992, to the New Jersey Education Association, New Jersey Association of Supervision and Curriculum Development, the New Jersey Principals and Supervisors Association, New Jersey School Boards Association, the New Jersey Department of Education, the New Jersey School Counselor's Association, the Technology Education Association of New Jersey, and the New Jersey Association of School Administrators.

The TELS conference brochure was mailed the first two weeks of April, 1992. Approximately 2,000 brochures were mailed to superintendents, directors of curriculum and instruction, elementary counselors, elementary technology teachers, technology for children teachers, and the New Jersey Career Development Guidelines Advisory Committee. Two hundred brochures were distributed at the April 2 and 3, 1992, conference of the New Jersey School Counselor Association, and 600 brochures were to be distributed at the May 1992, conference of the Technology Education Association of New Jersey (TEANJ). Each of the eight TELS districts had copies to distribute at functions they were attending as well. The conference was scheduled for May 29, 1992, and as of the April 28, 1992, meeting 53 paid registrations had been received. The TELS representatives were disappointed with the low registration rate four weeks before the conference, but we had broken even financially with those registrations. Randolph representatives would be making three different presentations at the upcoming TEANJ conference and would highlight the TELS conference.

On May 7, 1992, the Technology Education Conference '92 was held in Princeton, New Jersey, sponsored by TEANJ. The consultant organizing this conference was the same one responsible for organizing the TELS conference. In the registration packet for this conference was a brochure and registration form for the TELS conference. The manager and the TELS curriculum coordinator made a presentation entitled, "Technology Education at the Elementary Grade Level," to a standing-room-only audience of 80 people. The TELS conference was highlighted and the audience was asked to review the brochure in their packet.

The manager made a second presentation entitled, "Gender-Friendly Technology Education." There was also an overflow audience for this presentation. The manager asked the audience their grade level and their motivation for attending this particular workshop. There were a few elementary teachers, but the majority of people worked at the middle level, grades 5 through 8, or the high school level. They were most interested in attracting females to their program. Females were emphasized in the presentation, but the importance of equality in treatment of both boys and girls was also discussed. The handout prepared (see Appendix K) gave a listing of general equity resources and proven technology activities which were enjoyed by all students but were particularly favored by females. The importance of ongoing initiatives at the elementary level were discussed and the TELS conference was again highlighted.

The middle-level technology teacher, recognized as a state leader, made a presentation on middle-level technology education entitled, "Technology Work Stations," and had approximately 60 people in attendance. During his presentation, he mentioned the importance of elementary school initiatives and encouraged participation in the TELS conference.

Highlighting the TELS conference in three presentations and making note of the consultant and where she could be found during the day seemed to be effective. The consultant said she received many inquiries about the TELS conference and did receive 12 paid registrations that day. By May 10, 1992, there were 74 paid registrations, by May 19 there were 199 paid registrations, and two days prior to the TELS conference there were 240 paid registrations. The final number of registrants in attendance at the conference were 306, 42 of which were guests of the eight TELS schools.

There were 12 Randolph TELS teachers present at the conference. One of the workshops was designed as a question and answer session on how to develop and carry out technology activities in the classroom. The Randolph Curriculum Coordinator was the facilitator and seven Randolph TELS teachers in attendance fielded questions during this session.

Every Randolph teacher in attendance made a point of personally discussing with the manager their satisfaction with being associated with the TELS project. After reviewing the documents from the other seven schools, they believed the time they spent on TLA development was well spent. The document that resulted was top quality and very user friendly. Of the 12 teachers in attendance, 9 chose to continue participation in TELLS for the 1992-1993 school year.

The last component of this objective was development of a second-year implementation plan to continue with the initiatives to implement technology education at the elementary level. There was not a follow-up grant to continue financial support for the activities begun in 1991-1992. A plan was developed by the manager to keep the momentum going by finding the dollars to keep the curriculum coordinator, even if that meant no additional money for supplies or other support. The superintendent would not recommend additional dollars for personnel, even though he was extremely pleased with the project and saw that systemic change was possible at the classroom level by continuation of this particular project. Three of the teachers most active in the year's activities wrote personal letters to the superintendent making a plea to retain the curriculum coordinator. When it was clear that the grant personnel would not be reemployed, eight of the participating teachers approached the manager requesting that I keep the project going and that they would help. It was impossible for the manager to support the elementary teachers as the curriculum coordinator was able to do because the manager was already responsible for 17 staff in three disciplines across all six schools, kindergarten through grade 12. With the help of interested teachers, however, a plan was developed to allow continuation of the project.

During the first week of September 1992, the manager sent memos to the 28 Curriculum Development Committee members asking them if they would be interested in continuing the work of the TELS grant. Eleven of the teachers responded that they would like the project to continue and would actively participate. These teachers also noted that they were strong believers in the process methods used in technology education and that the students must learn to be critical thinkers and problems solvers if they are to succeed in the future. The four elementary schools were represented equitably, although this had not been a requirement. One school had two representatives, the other three schools each had three representatives. All grade levels were represented except grade 4.

A two-hour orientation meeting was held October 21, 1992, to review the success of the past year and to develop initial plans for continuing the project. A full-day inservice session was held November 2, 1992, to finalize the year's strategies.

It was determined that people in all levels of the organization already recognized the name TELS and to change the name of the initiative at this point would be confusing. Since it was also concluded that most people did not know what TELS stood for, there was some flexibility in adjusting the name to better represent the initiative's purpose. Teaching Essential Life Skills (TELS) was changed to Technology Education for Lifelong Learning Skills (TELLS). The logo developed during the initial project would remain the same using the catchphrase Minds in Motion, but the new project title, TELLS, would be incorporated (see Appendix L).

The union troubles of the past year were discussed and the teachers believed that some of the 28 teachers of last year's initiative would attempt to undermine their current initiative. To minimize the complaints and the resistance, the teachers decided they would prefer their current initiatives be viewed as grass roots. They would achieve this image by being the building leaders in this effort, working with other staff, coordinating meetings as needed, and collecting the data on their own classroom activities. They would like the manager to be available for support and to coordinate district level activities. This structure would lend credibility to the project because it would have highly motivated teachers helping other teachers rather than an administrator imposing another project on the staff. The peer coaching objective that had to be abandoned last year was now being embraced by the new TELLS teachers as an effective implementation method.

The following objectives were established by the new TELLS project teachers. These objectives were designed to meet the goal of implementing the principles of technology education in more classrooms in the district.

First, each school's team would make a presentation to their respective faculties about the project. They would discuss the principles of technology education, the importance of the skills taught through technology education, and would offer help to their peers in implementing these principles using the TLAs developed through last year's grant. All the meetings would be held during January 1993.

Second, the TELLS teachers would continue to use the activities developed last year. They would document the classroom processes and revise the activities as appropriate. New activities would be developed over the year with the help of the manager as needed. The teachers would take pictures of their classes in action and would keep a log of their activities and their supporting documentation.

Next they would encourage other teachers to try the developed TLAs. They would elicit volunteers at their introductory faculty meetings and would approach individual teachers who have a teaching style which may accommodate these types of activities. After much discussion it was determined that because they, themselves, would be implementing last year's TLAs as well as developing and testing new TLAs, they should not attempt to work with teachers who were not enthusiastic about trying a new approach to teaching. The manager reinforced that they should not attempt to "save" teachers who were not interested in being challenged, but should use their energy more wisely by working with more receptive staff.

Equity, with emphasis on gender equity, was discussed. The TELLS teachers were very interested in hearing and learning more about equity in the classroom. They requested that their next inservice emphasize these issues. This issue had been deleted from last year's project due to the difficulty in getting the project underway and completed due to tough resistance and tight time frames. Equity would now have an opportunity to be addressed effectively with staff truly interested in the topic and best able to disseminate information as they worked with their peers on TLAs.

Last, a district inservice plan was developed and approved by the Assistant Superintendent for Curriculum and Instruction during December 1992. The plan included a special inservice day to be held during the fall of 1993 and devoted to technology education. Elementary teachers could participate in a full day of training and would be able to use implementation of technology education principles as their professional improvement plan, a state required staff development process, for the 1993-1994 school year. The keynote speaker that day would be determined by the TELLS team and would discuss technology education and the future of education. After this first day, there would be a second half day session later in the year to review progress and offer more advanced principles.

The TELLS teachers would plan all the inservice and support activities needed for the 1993-1994 school year. They would be paid for one week's work during July 1993, at which time all components of the project would be analyzed, revised, and readied for implementation.

Terminal objective 4. Increasing female enrollment in technology education means educating parents about technology education and why it would be of value to their children, particularly their female children. A family program at the elementary level would help achieve this goal; and it seemed appropriate to develop a family technology program based on the very successful Family Math program currently held in district.

During the fall of 1991, the manager met with the Supervisor of Special Projects, the person responsible to organizing the Family Math program. She very much liked the idea of offering a family technology program. First of all the demand was there, families had been turned away from other evening programs every year, so an additional program could fill the need. Such a program would also further support the classroom initiatives of the TELS grant which had garnered parental interest. It had been brought up at a number of Board meetings by members of the audience and two letters had been received supporting such classroom activities.

The initial plan had been to secure the Family Math facilitator manuals from the district staff slated to teach the program to see the format for the activities. There would be a series of meetings held with the middle-level technology teacher who wished to work with the manager in developing a family technology program. This meeting time would be used to evaluate materials and plan the approach family technology would take in developing appropriate activities. The developmental work would take place from January through March 1992, and the program would be offered in April 1992. A turn of events, however, negated this objective in the planned format. The final result, however, should have much more dramatic impact.

The technology teacher who would work with the manager on this initiative attended a meeting of the Technology Education Association of New Jersey and discussed our idea. One woman who was in attendance talked with the teacher further about the idea. As a result, the idea was presented to the Project Director of the Consortium for Educational Equity, Rutgers University. A three-year grant was applied for through the New Jersey Department of Higher Education to develop the family technology program, and the grant was awarded to Rutgers. The program would be called Family Tools and Technology (FT^3). The technology teacher was approached initially with two other people to develop the program during the summer of 1992. As a result of problems that emerged, the only remaining member of the original team was the Randolph teacher. The manager was approached in September 1992, to work on the grant. The manager, the technology teacher, and the Consortium Project Director met November 18, 1992, to review the developed materials and finalize the program to be presented to the teacher representatives from the 10 pilot school districts from around the state.

Because this plan had now become a statewide initiative with hopes of presenting it nationally, the local initiative was abandoned and we would, instead, participate as one of the 10 pilot schools. The training for the facilitators from each district and the implementation of the programs at each school would take place between January and April 1993.

Summary of Accomplishments

Terminal objective 1. Female enrollment increased from 10% to 12% of total course enrollment in the grade 8 elective, Junior Engineering. Students and guidance counselors were questioned about their views of the courses and its goals, and misconceptions were found regarding the course content and purpose. Because the misunderstandings were stated by both boys and girls, the initiatives planned addressed the entire student population.

Students in the Introduction to Technology course were questioned and surveyed to determine their favorite activities in order to realign the curriculum in the grades 7 and 8 technology program. Because the research and development format of the courses would remain the same, the topics covered could be adjusted without jeopardizing program quality. The topics covered were realigned and the Junior Engineering course of study was completely redesigned (see Appendix C).

The manager continually met with the middle-level guidance counselors. Their bias tended to steer females to home economics and males to technology. Heightening their awareness of the value of technology for all students was a continual effort.

Terminal objective 2. Only 9% of total enrollment were females in the high school level technology program for the 1992-1993 school year. The goal, increasing female enrollment to 20%, was not achieved. The females enrolled in the program during 1991-1992 were interviewed in order to gain insight into the lack of female enrollment. Male students were also questioned about the lack of enrollment in general, and it was determined that more work had to be done to enlighten the guidance counselors to the value of technology education. The students questioned also believed that not enough was done to publicize the department.

Two initiatives were undertaken at the high school. The Technology Student of the Month Recognition Program was continued and was successful. A publicity newsletter was also prepared and distributed to all grade 9 through 11 students prior to course selection for 1992-1993. The newsletter highlighted the successes of the department, the courses that were available, and the activities that happened in those courses over a year.

The manager made presentations at the Eighth Grade Parents Night to inform parents of the technology program, our goals, and the value of the courses to their sons and daughters. Presentations were also made to all eighth grade students in an effort to encourage them to select a technology course in their ninth grade schedule. Although interest in the program seemed high, it did not result in increases in enrollment.

Terminal objective 3. In order to complete the TELS grant activities, two administrators were employed, a curriculum coordinator and a guidance counselor. The majority of the counselor's activities consisted of district level program development. The curriculum coordinator would work closely with the 28 elementary teachers selected to participate on the curriculum development committee.

There was quite a bit of adversity through the teacher's union to this project, but it was the January 1992 meetings with the Curriculum Development Committee which represented the turning point in heading this project toward successful completion. At this point the teachers who would work with us were clearly involved and those still resisting were clearly overlooked by their peers. At this set of meetings, the teachers were finally willing to state their personal uncertainties regarding implementing technology education activities in the elementary classrooms. We reviewed the philosophical perspective of technology education and the process to achieve success in TLA development and classroom implementation. It was from this point that it became clear the majority of the members of the Curriculum Development Committee would work with the project team to make this project a success.

The TELS conference, the culminating activity of the grant, was cosponsored by the eight recipient school districts and held May 29, 1992. Although there had been trepidation about being able to attract even the 50 attendees needed to break even financially, there were 306 registrants. Twelve Randolph TELS teachers were in attendance and seven participated as active contributors at one of the workshops.

A second-year implementation plan was developed to continue the initiatives of the TELS grant. There would be no additional resources allotted to this initiative, however 11 teachers involved the first year developed a plan to continue the initiative under the name of Technology Education for Lifelong Learning Skills (TELLS).

Terminal objective 4. The original plan to develop and implement a family technology evening program for students and their parents was preempted by the opportunity to participate in the development and implementation of a statewide program. The manager, the middle-level technology teacher, and the project director from Rutgers were responsible for development of Family Tools and Technology (FT^2), the new family program through the Consortium for Educational Equity, Rutgers University. Randolph is one of the 10 pilot schools for the 1992-1993 school year.

Chapter 6

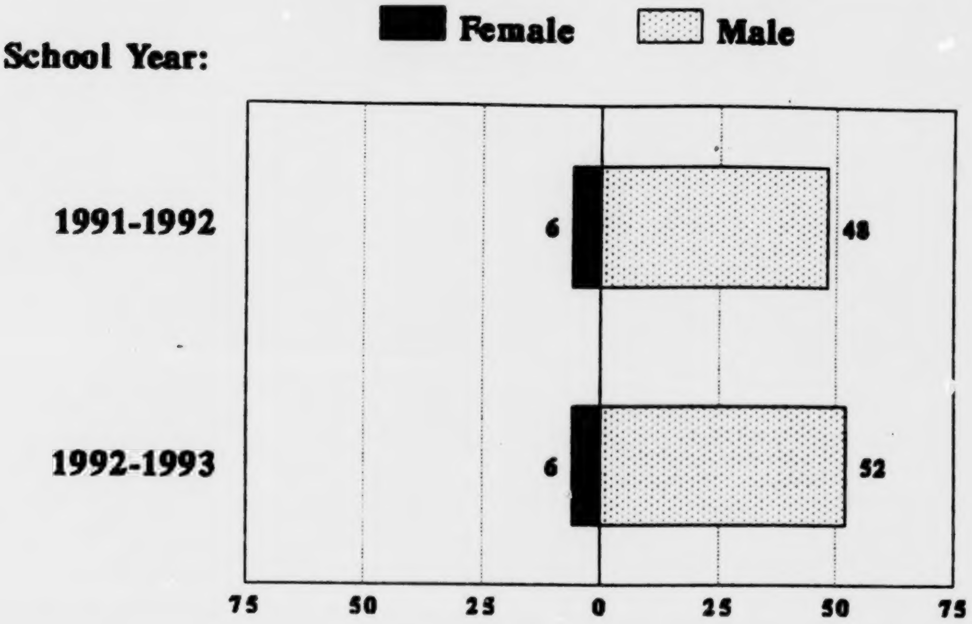
Evaluation of Results and Process

Project Outcomes and Processes Used to Achieve Them

There were four objectives planned to effectively market technology education in an effort to increase female enrollment in that program. The interventions dealt with attitudes and behaviors of students, professional staff, and parents. Two of the four objectives involved direct work with these groups within the high school and the intermediate school. Another objective dealt with a major elementary-level initiative to infuse technology education principles and practices in kindergarten through grade 6 classrooms on a pilot basis, with plans to extend the pilot project into a district wide objective the second and third years. The last objective dealt with the development of an evening family program which would allow an elementary child and his/her parent or parents to explore technological areas together. Because the objectives are not directly related, each will be discussed separately for clarity.

Terminal objective 1. The purpose of this objective was to maintain 10% female enrollment in the grade 8 elective, Junior Engineering, to be shown in the June 1992 enrollment figures for the 1992-1993 school year. During the 1991-1992 school year there was 13% female enrollment, and the objective of maintaining at least 10% female enrollment for the 1992-1993 school year was achieved with 12% female enrollment. The actual number of females enrolled remained constant (see Figure 2), although the male enrollment did increase slightly over 1991-1992.

Figure 2. Two-Year Junior Engineering Enrollment Comparison



The initial meetings with the two middle-level guidance counselors in the fall of 1990 revealed that they were not aware of the content of Junior Engineering other than their perceptions. When asked by the manager what they believed was taught in the course, they said we had the students build model race cars. They both said they shared this information with students interested in signing up for the course when asked what would be done in Junior Engineering. Both counselors said that the girls were not interested in building race cars and they did not blame them, it is not really a girl's type of activity. This general misunderstanding of the purpose of the course resulting in limited narrative with the students was seriously undermining efforts to attract more females to the program.

The manager shared this information with the technology teachers in the intermediate school and asked the teacher teaching Introduction to Technology to informally discuss with his students their understanding of what was taught in Junior Engineering. Comments were collected throughout the 1990-1991 school year, and there were three basic responses. The largest response was that they did not know what Junior Engineering was or what was taught in the course. Secondly, students believed that what was done in Junior Engineering was just more of the same activities done in Introduction to Technology. Lastly, we heard the comment about model race cars, with some students looking forward to being involved and others saying they did not want to take the course because they did not want to build race cars. Approximately 60 students were involved in this initial sharing of perceptions and attitudes. These students were a cross section of grade 7 and 8--males and females across all ability groups. The purpose for informally gathering this information was to gauge the understanding of our program by the students. The information was useful because it showed that not only did the guidance counselors misunderstand Junior Engineering, but that students were also unaware of the actual course content and were making course selection decisions based on misconceptions.

The comments collected from the students by the technology teacher and the information gathered by the manager from the guidance counselors regarding their understanding of the Junior Engineering course were discussed among the technology teachers and the manager throughout the 1990-1991 school year. During May 1991, the information informally gathered was analyzed and helped clarify a possible cause of students failing to enroll in Junior Engineering. The students believed duplication of a broad topic category in both Introduction to Technology and Junior Engineering meant duplication of activities. Students were, therefore, planning not to enroll in Junior Engineering. This information meant more work needed to be done to enlighten both the guidance counselors and the students on the true nature of technology education and the content and value of a engineering introduction such as Junior Engineering. It also meant a serious look at the curriculum to ensure loose coupling of activities from course to course to ensure duplication of effort was not happening or being perceived as happening in the middle-level program.

Since students were being told the counselor's opinion of the Junior Engineering course, it was important that counselor's opinion be based on the facts. The manager met with the counselors throughout the 1991-1992 school year on this issue and invited them to visit the classrooms to see what the types of activities were being done and the problem solving methods being used. The relevance of this course for girls as well as boys was discussed throughout the spring of 1992 as the counselors were registering the seventh grade students for their eighth grade courses. During this same time, the technology teachers were talking to all their seventh grade classes encouraging them to take Junior Engineering and explaining what the program had to offer students. The technology teachers had also prepared special hall displays with products and documentation that were developed by students in the Junior Engineering course. There were publicity posters hung in the building talking about the Junior Engineering courses. It is this manager's opinion, however, that the efforts with the guidance counselors were most responsible for increasing the female enrollment.

After the technology teacher completed surveying students in Introduction to Technology throughout the 1990-1991 school year regarding their favorite activity, the middle-level curriculum was thoroughly evaluated. The favorite activities became permanent options in Introduction to Technology. The top two categories that were the most favored by each gender would be included in the Junior Engineering course of study--structures, control technology, and computer graphics. Careers were also integrated into the content as a result of the eighth grade survey done in 1990 which revealed that students lacked understanding of the skills required to pursue various career opportunities. The final product, the Junior Engineering course of study (see Appendix B), was implemented in September 1992.

Terminal objective 2. We fell short of our goal of 20% female enrollment in the high school technology program (see Table 5), even though the activities to accomplish this objective were carried out as planned. The female enrollment remained consistent with past years when females accounted for never more than 11% of total enrollment. There was only 9% female enrollment in the technology program for 1992-1993.

Even with the initiatives undertaken, the females involved in the technology program believed not enough was known about the program by the student population. Since the initiatives where well publicized and the newsletter blanketed the student body, these attempts were obviously not as effective as it was thought they would be when planned. When discussing this problem again with the Director of Pupil Personnel Services and the technology teachers, it was determined that we needed to focus on a narrower band of students in the upper grades who had career aspirations in the technical areas of math, science, and engineering. Most of the technology education female enrollment consisted of ninth grade students, yet the number of electives the grade 9 students could select was very limited due to academic requirements. It was clear that the older students, who did have more time for electives in their schedule, were not selecting technology courses. Although the general types of activities carried out through this project were having some impact on student awareness of the technology program, the majority of the high school students,

Table 5

High School Technology Course Enrollment for 1992-1993

Course Titles		Number of Female	Number of Male
Technology and Design (basic first year course)		3	35
Electronics Technology		0	4
Robotics & Control Technology		0	6
Drafting and Design:	Level 1	5	32
	Level 2	2	23
	Level 3	0	12
	Level 4	0	4
TOTAL:		10	112

particularly females, were not being effectively swayed to participate. The enrollment of grades 10, 11, and 12 females did not increase.

Terminal objective 3. The result of the TELS grant initiative was that the 28 teachers participating on the Curriculum Development Committee worked in grade-level groups to develop a minimum of 3 language arts and 3 math technology learning activities (TLAs). There were a total of 46 TLAs written. Grades 1, 2, 4, and 6 teachers had the required 6 completed. Kindergarten teachers developed and tested 8 activities, and grades 3 and 5 teachers developed 7 activities. Of the 46 activities, 11 were not tried in the classroom. The structured peer coaching and cooperative learning components of the objective were abandoned because of time constraints and problems orienting the teachers to the process learning strategies of technology education.

The statewide Teaching Essential Life Skills (TELS) Conference was held May 29, 1992, with 306 people in attendance. There were 12 teachers from our project in attendance, 7 of whom were active participants in the workshop offered for teachers on implementing technology learning activities in the elementary classroom.

The conference consultant was responsible for collecting and collating the conference evaluation data summarized in Table 6 (Horowitz, 1992). There were only 48 completed forms received from the possible 264 paid registrants requested to complete an evaluation.

The evaluation forms returned had high ratings in most categories and many comments on the conference in general and the workshops in particular. With the exception of comments related to lunch being late and the keynote speaker not being particularly effective, the comments were all positive and appreciative. The low response rate was disappointing, but not unexpected. The consultant said that from her experience in running conferences around the state over the last five years this response rate of approximately 18% was typical.

Table 6

TELS Conference Evaluation

	Very Much		Somewhat		Not At All
	5	4	3	2	1
Was the keynote speaker effective?			3.5		
Were the workshop speakers effective?			4.3		
Were the workshop sessions productive?			4.2		
Were the conference materials useful?			4.5		
Was the conference schedule satisfactory?			4.5		
How would you rate the hotel site?			4.8		

A second-year implementation was initiated by the manager, and 11 of the original 28 teachers volunteered to continue the project. The activities planned for the 1992-1993 school year included the peer coaching and cooperative learning components abandoned the first year. They have also requested the manager offer training on equity, particularly gender equity.

Terminal objective 4. The plan to locally develop a family technology evening program was replace with the opportunity to develop a statewide, three-year initiative through the Consortium for Educational Equity, Rutgers University, entitled Family Tools and Technology (FT^3). One Randolph technology teacher and the manager developed the program and Randolph would participate as one of the 10 pilot schools for the 1992-1993 school year. The program is slated for local implementation during February 1993.

Reflections on the Solution Strategy

Changing attitudes and perceptions is always difficult and takes a tremendous commitment of time and resources, two commodities which are always in short supply in an educational setting. In an effort to use both to their greatest advantage, it was determined that the initiative at the elementary level held the best hope of true change, but it would take more time than the length of this project. Immediate returns from such efforts would be difficult to determine, but persistence in pursuing those efforts could change the female attitude toward math, science, and technical areas of study.

The TELS grant project was a solid infusion of resources at the elementary level. We had to compress the planned activities into one year, although they would have been much more effective spread over two years. The continuation of the project for the 1992-1993 school year by the most interested staff is enabling us to implement the peer coaching and cooperative learning components which had to be abandoned last year, as well as the continued development of interdisciplinary technology learning activities. The severely limited resources--time and money--dedicated to the project this year, however, is hampering more effective continued implementation. Finding cost effective means of carrying out a project is important, but no project can be run without some additional resources allocated.

The TELS conference was a good tool for disseminating information about technology education at the elementary level. It was run effectively and was more successful than projected. It also affirmed the work of the teachers involved in our project. They received positive feedback from their peers from throughout New Jersey and had the opportunity to see and compare their work with the work of the other seven TELS districts. It was at this conference that the teachers first approached the manager about keeping the project going regardless of resources availability.

The initiatives at the intermediate school were effective. The continual one-on-one meetings with the two guidance counselors were productive. Their heightened awareness of the technology program allowed them to recommend the program to students and encourage females interested in technical careers to participate.

The concept of role models is noted consistently as important in the review of literature. Because we have no female technology teachers, extra attention had to be paid to the females by the teachers to compensate. The females were encouraged to try new areas and to participate in special projects the teacher developed. The classroom interaction studies of Sadker and Sadker (1986) were used as the basis to help build self-esteem through the attention given to females by the teachers. Even if the girls were not going to enroll in Junior Engineering, they were encouraged to participate in the high school program. The comments of the high school grade 9 students in the technology program reinforced that teacher attention paid off in enrollment at the high school. The teacher in the classroom and the interactions with the students demonstrated by that teacher are so powerful, as shown in this project and through the review of literature, that this manager believed no initiative could be effective without the complete support of the teachers in helping students build self-esteem and confidence in their own abilities.

The activities at the high school level can be viewed in retrospect as a basis on which to build a campaign to increase female enrollment, but not the answer to the problem. As the literature pointed out, targeting young women and working intensely with them on an initiative would be more successful than more broad based efforts. In addition to the general awareness activities pursued in this project, there could have been an effort to identify young women in the upper grades who would be good candidates for a preengineering program of studies. The science teachers could also have been targeted as helpful in the determination of students who would benefit from the technology program. A more focused effort in addition to general awareness holds more hope for success in attracting females to technical studies.

Parental understanding of technology education is important in order to garner additional support for implementing the processes and principles in the classrooms. The idea of an evening parent program held much hope in gathering support. Because the plan was implemented in a statewide initiative through the Consortium for Educational Equity at Rutgers University, there will be a different level of prestige attached to participating, adding weight to the value of the concepts of technology education. This result had not been anticipated but was most welcomed and opens an opportunity to infuse technology education into classrooms throughout New Jersey through initial participation in Family Tools and Technology.

Implications of Outcomes and Processes

The review of literature, particularly the work done by Loucks-Horsley et. al. (1990), stressed the importance of ongoing teacher support systems and strong administrative support. When new initiatives are introduced and left to go their own way or when too many new initiatives are introduced over too short a time frame, the chances of realizing a successful, growing intervention is diminished. Teachers become overwhelmed and unwilling to devote the time and energy needed when the district commitment wanes after the first year in favor of a brand new initiative. The quick-start strategy offered by Loucks-Horsley et. al (1990) is the model we attempted to implement in one year, although they recommend a two-year process. The focus of this model is extensive work with and support of the teachers, a shared leadership team of teachers and administrators to monitor implementation, and an awareness campaign to inform all others of the activities.

The TELS grant activities were very high profile and had the potential to cause systemic change in the elementary classroom. Although the TELS initiative is continuing a second year with dedicated classroom teachers being instrumental in developing and leading the current activities, the commitment and support from the district leaders has been weak. Without a commitment of resources, the initiative will be successful only with the limited number of teachers willing to commit personally to an alternative teaching method.

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In order to attract females into nontraditional technical areas of study, the females must be targeted more closely for interest and ability. Teachers are critical in the classroom interactions and support they offer the female students in pursuing more nontraditional alternatives. Guidance counselors are at the point between the parents and students and the courses available. They must understand the options and be aware of the impact their own bias will have on females considering nontraditional career options. The gender bias of adults in the educational community can have serious effects not only on the choices offered to students, but also on the continued support students would need to pursue those choices. More resources should be devoted to dealing with those biases, those of the adults as well as those of the students.

Chapter 7

Decisions on Future of the Intervention

Maintain, Modify, or Abandon

The female enrollment in the technology education program, grades 7 through 12, continues to average 10% of total enrollment. The intermediate school experienced a 2% increase in female enrollment in the technology program, but the high school program realized a 1% decrease, remaining consistent with past female enrollment of never more than 11%, with 9% female enrollment for the 1992-93 school year. Although the initiatives at the high school did not result in increased female enrollment, all the initiatives should be continued and expanded to reach a greater number of students on a more personal level. The manager interviewed all female technology students regarding increasing enrollment, and the girls responded that the efforts simply were not going far enough. The girls believed that too many students were not aware of the technology program or the benefits of the courses because no one really talks to them personally about getting involved in the program.

The manager and the technology teachers met to discuss the lack of female enrollment and determined that an expanded program of targeting students, particularly female students, was needed. The department members needed to find ways to be more personally involved with individual students, presenting them with information on preengineering options at the high school and how the technology department could enhance their preparation. It was determined that certain courses attract potential mathematics, science, or engineering career candidates. Presentations on the technology program made in those classes during the month of January (prior to February course selection) may offer more opportunities to target potentially interested students.

Ultimately, the greatest hope of increasing the number of females who pursue careers in mathematics, science, and engineering remains with changing the attitudes of youngsters and their parents early in their educational careers--elementary school. Attitudes toward equity are formed early in life, and the best hope of realizing educational equity is by addressing equity concerns at the elementary level.

All elective programs in the public schools have the need to effectively market their programs in order to survive from year to year. Having a quality program and making parents, students, and peers aware of that program is a never-ending requirement. The elective programs are also give the schools the richness and depth of exploration needed for students to make wiser career choices. It is in high school where the best chances are available to explore a wide range of courses and career options, and that opportunity may not be available to students again once they have graduated from high school. More effective marketing strategies must be developed for the schools to publicize the richness of their programs. Continued support for the elective programs is also needed rather than having program pitted again program annually, with each program attempting to attract enough enrollment to justify their survival for another year. A broad elective program will ensure that students have the opportunity to actively participate in many areas, helping them make a wiser decision on a career goal.

Additional Applications

Technology education is a teaching-learning process which places the teacher in the role of facilitator, giving back to the student the responsibility for learning through exploration, critical thinking, and problem solving. Cooperative learning is an integral component of the technology education process, and research over the past 10 years has shown that cooperative learning results in higher student achievement (Joyce, et. al., 1987). With all the calls for restructuring education, a tool to achieve higher achievement in our students is available in the processes of technology education, yet few seem to recognize the potential and power of this process for learning. It is certainly important that more females get involved in mathematics, science, and technology, however, it is also important that all people become more technically literate; able to think critically; able to use a method to approach and solve problems, both personally and professionally; and become life-long learners. This is the challenge for the future of schooling, and technology education holds answers for all disciplines.

Throughout the TELS grant project the manager made presentations around the state regarding technology education. These presentations were made through technology organizations, such as the New Jersey Technology Education Association, and through organizations such as New Jersey Association of Supervision and Curriculum Development and the Morris County Curriculum Network. Many of these conferences have been attended by Randolph staff who teach in the academic areas and guidance counselors, kindergarten through grade 12. As a result of these presentations, which have continued into the 1992-1993 school year, guidance counselors and academic teachers have expressed dismay that they did not know about either the technology initiatives, the existing curriculum, or how exciting and important it is for students. The realization that the publicity the department had developed and distributed over the last five years was not effective was disappointing but proved the point that people instrumental in influencing or helping students select a program of studies were not aware of the benefits of technology education. Two high school English teachers, five science teachers, two mathematics teachers, three academic supervisors, and one middle school guidance counselor have begun to talk to their peers and students about the program and value of technology education after viewing one or more presentations. This type of support was unexpected because there were no plans to tackle attitudes and behaviors of grades 7 through 12 professional staff other than guidance counselors, although tackling the biases and attitudes of the adults in the educational community might be an effective strategy for increasing female participation in nontraditional career paths.

This support from professional staff affirmed the need to offer staff development, particularly on awareness of what is happening in disciplines other than that in which one teaches. It was obvious throughout our project that the teachers were not aware of what other teachers were doing, the goals of other programs, or even the purpose and methods of teachers at other grade levels. There was a lack of appreciation for peers due to unfamiliarity with the entire educational picture and benefits for children.

The professional staff of any school district is the most costly commodity, therefore, it should also be its greatest asset with care taken to ensure the health and growth of that asset. Projects conducted by Showers (Fielding and Del Schalock, 1985) have shown that "well-designed professional development programs can succeed in changing what teachers do and in increasing their effectiveness" (p. 29). Resources for professional development are the resources most often cut or transferred to other initiatives, yet expending resources on professional development activities holds the greatest hope for making the changes in education that appear to be wanted at the national, state, and even local level. As Raebeck (1990) stated when discussing his schools transformation to a middle school and the importance of substantial staff development, "We did not build a climate that is positive for students at the expense of teachers" (p. 20). The teachers are the ones that will make the initiatives succeed or fail. They must be expected to grow and helped in that process through well-designed development programs focused on a district's objectives. If we are asking our teachers make their students love to learn and become life-long learners, we should expect the same from the teachers and strongly support them in that endeavor.

Dissemination of Information About Benefits

There has been growing interest in the concepts of technology education, if requests to present information at various meetings and conferences can be considered a gauge of interest. The manager has presented workshops and given presentations to groups of business education supervisors, technology teachers, curriculum leaders from throughout northern New Jersey, guidance counselors, and elementary teachers and administrators. I believe the interest is the result of technology education being more than a discipline, it is a process for learning that is interdisciplinary and challenges students to be creative problem solvers and independent thinkers able to work as a team to accomplish a goal. The eight TELS projects, their newsletters distributed throughout New Jersey and final documents disseminated at the conference, helped elementary educators understand and appreciate the potential for technology education as a teaching-learning process.

The TELS product published by Randolph Township, a turnkey guide to implementing technology education and career guidance in kindergarten through grade 6, has been distributed throughout New Jersey. Over three hundred books were distributed since May 1992. The book was accepted for publication through the Educational Resources Information Center (ERIC) in September 1992 and will soon be available on microfiche through ERIC. It will also be displayed as a model curriculum at the national conference of the Association of Supervision and Curriculum Development (ASCD) the winter of 1993, and was the elementary-level model used for the turnkey curriculum developed by the Technology Education Association of New Jersey (TEANJ). This curriculum packet, along with a middle school curriculum and high school curriculum, will be presented and made available at the International Technology Education Association Convention in North Carolina in April 1993.

The work with Rutgers University to develop and pilot Family Tools and Technology has great potential for widespread dissemination. There are currently 10 pilot schools and a waiting list of 25 schools wishing to participate. There will be an additional 10 schools added to the program each of the next two years and then the project will be open to offer the training to more schools. The representatives from the first-year pilot schools are all classroom teachers. They have been asking if there are additional activities available because they would like to implement these types of processes into their classrooms in addition to the evening program. Although the Rutgers grant was not designed to deal with classroom implementation, having the TELS material available has offered additional opportunities for these teachers.

Recommendations

When reviewing this entire project, it is clear that the initiatives at the high school were not effective and should have been better focused on a population which would be particularly interested in preengineering. This would have meant more meaningful work with guidance staff and other teachers. With the scope of this project being kindergarten through grade 12, the time and energy of the participants did not allow for more extensive planning and activities at this level. Quite simply, the scope of this project was too large, although I would recommend continual publicity and awareness promotions at the high school level. In the part of this project that deals with behaviors and attitudes, I would limit the scope to kindergarten through grade 8 initially.

With an initiative such as this, asking elementary teachers to change their teaching style and look for more exciting ways to challenge students to think and learn, professional staff development was an absolutely critical component. Having a person on staff, in our case the elementary curriculum coordinator, who would work solely with the classroom teachers made the difference between success and failure in this manager's opinion. The teachers had someone they could call upon and rely upon for help, support, and critical analysis related to self-improvement. The teachers themselves stated it made a big difference in their willingness to risk change by having a support person there for them throughout the year.

The importance of the teacher and that teacher's interactions with the students became very clear. It was the Introduction to Technology teacher spending time with the females and strongly supporting efforts and reinforcing their successes that lead to some girls taking technology courses at the high school. When working with the elementary teachers, it was the teacher who was excited about trying a technology activity that got their students excited and achieved success. The power of the teacher in the classroom and the impact on the students is clear to an observer, but it may not be as clear to the teachers themselves. There was one teacher who believed that these activities were better left to the boys, and when she implemented an activity she urged the girls to get help from the boys on questions they had. This can be very damaging to the self-esteem of the female students and the teacher was actually unaware of any problem with her approach to the projects. Again, the professional staff development of staff is critical to help them understand the impact of their actions in classrooms.

The manager had many opportunities for professional growth as a result of this project. I have had the opportunity to speak to many groups about technology education, which I believe is one answer to the aspects of education which are failing our students. I have also had the opportunity to speak to groups about gender equity. My own staff has expressed growing interest in gender issues and the impact their own teaching has on encouraging or discouraging males and females from actively participating in their programs.

Having to work with elementary teachers toward a goal that had to be met, while knowing that the majority of those teachers did not want to participate, was a unique learning experience. It offered me opportunities to analyze my own leadership style in depth and consider many alternatives to getting people working together toward a common goal. With the project being such high profile in the district, as well as being publicized throughout New Jersey, the results of all efforts would be clearly seen and available to be scrutinized by all who wished to do so. This was clearly the largest, riskiest, and most rewarding experience this manager has undertaken and accomplished in her professional career.

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Appendices

Appendix A

Technology and Careers Awareness Survey Instrument

TECHNOLOGY EDUCATION DEPARTMENT
TECHNOLOGY AND CAREERS AWARENESS SURVEY

DIRECTIONS:

** There are no right or wrong answers to any of these questions.

** Please answer the questions honestly. It is very important to our results!

** If you'd like to tell more about why you answered a question a certain way, please use the blank space on the back of the sheet.

IMPORTANT INFORMATION: CHECK THE ONE THAT IS TRUE IN EACH QUESTION:

1. MALE: ☐ FEMALE: ☐

2. Your Name: (Please Print): ____________________

3. Are you aware of the sequence of courses we have in Automotive Technology?

YES ☐ NO ☐

4. Are you aware of the sequence of courses we have in Woods?

YES ☐ NO ☐

5. Are you aware of the sequence of courses we have in Graphic Communications?

YES ☐ NO ☐

6. Do you know what you would learn if you took Graphic Communications?

YES ☐ NO ☐

7. Are you aware of the sequence of courses we have in Pre-Engineering Technology?

YES ☐ NO ☐

8. Are you currently employed? YES ☐ NO ☐

If so, by whom?

____

9. a. What kind of job/career does your father have?

____

b. What company does he work for? ____________________

10. a. What kind of job/career does your mother have?

____

b. What company does she work for? ______________________________

11. What courses are you now taking in the Technology Department?

____

____

12. Do you WANT to take more TECHNOLOGY courses in the future?

YES ☐ NO ☐

WHY? ______________________________

____

____

____

13. What courses would you be interested in taking if they were offered?

____

____

____

14. Do you feel you know enough about different types of careers available?

YES ☐ NO ☐

15. a. What type of careers interest you now?

____

____

____

b. What types of careers would you like to know more about?

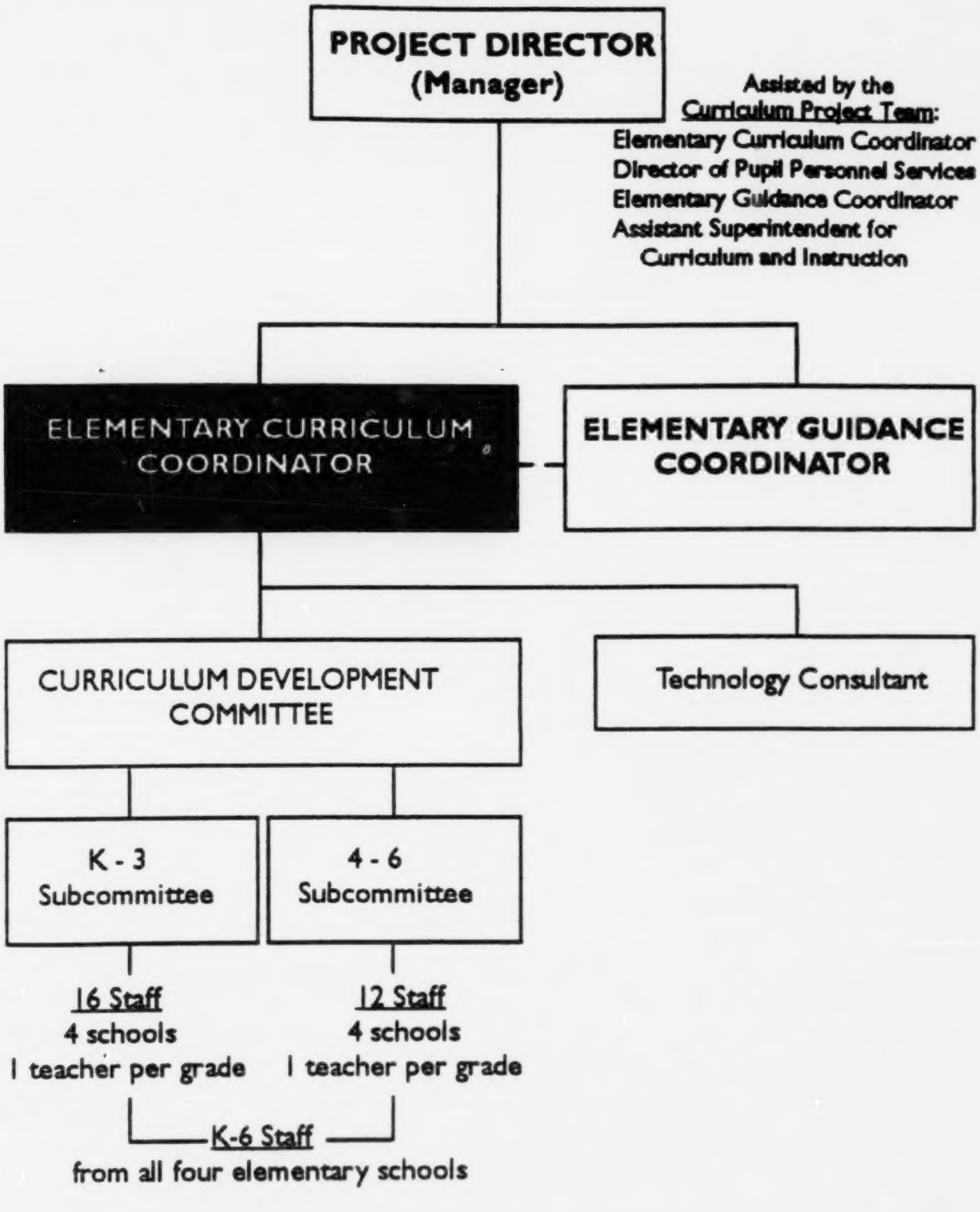
____

____

____

Appendix B

TELS Grant Organizational Chart


PROJECT DIRECTOR
(Manager)
Assisted by the
Curriculum Project Team:
Elementary Curriculum Coordinator
Director of Pupil Personnel Services
Elementary Guidance Coordinator
Assistant Superintendent for
Curriculum and Instruction
ELEMENTARY CURRICULUM COORDINATOR
ELEMENTARY GUIDANCE COORDINATOR
CURRICULUM DEVELOPMENT COMMITTEE
Technology Consultant
K - 3
Subcommittee
4 - 6
Subcommittee
16 Staff
4 schools
1 teacher per grade
12 Staff
4 schools
1 teacher per grade
K-6 Staff
from all four elementary schools

Appendix C

Junior Engineering Course of Study

JUNIOR ENGINEERING

COURSE DESCRIPTION

Junior Engineering offers eighth grade girls and boys the opportunity to design, technically draw, and build creative solutions to technology-related problems. Student are encouraged to be creative, original, and innovative as they explore engineering principles and develop original designs in the areas of bridge structures, living structures, toy design, control technology, and robotics.

Students are encouraged to participate in the Technology Student Association (TSA) competitions held each spring where they compare the genius of their original designs against others from throughout the State of New Jersey.

REQUIREMENTS

Prerequisite: None
Structure: This is a full-year elective open to all eighth grade students.

COURSE OBJECTIVES: Upon completion of the course, students will have:

1. developed a technological vocabulary and displayed a working knowledge of technological terms.
2. demonstrated acceptable standards of safety in the laboratory environment.
3. demonstrated the ability to identify and properly use drafting equipment.
4. developed and applied measuring skills necessary to complete drafting assignments.
5. demonstrated an understanding of the steps involved in problem solving.
6. applied creative problem-solving skills through the design process and modeling techniques.
7. gained the ability to make objective decisions through comparative analysis when evaluating a proposed solution to a design problem.
8. demonstrated the ability to effectively brainstorm and work with groups to critique plans.
9. demonstrated the ability to employ a wide range of communication skills including writing, recording, drawing, modeling, and speaking.
10. demonstrated correct tool and machine skills and application of those skills to project development.
11. demonstrated an understanding of the property of materials and manipulation of materials.

COURSE CONTENT		Approximate Number of Weeks per Unit (5 periods/week, 18 weeks/semester)
I.	Introduction to Engineering	1 (and ongoing)
II.	Introduction to Drafting and Design	8
III.	Structural Engineering	13
IV.	Introduction to Control Technology and Robotics	14

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RANDOLPH TOWNSHIP MIDDLE SCHOOL

COURSE CONTENT BY TOPIC OUTLINE	COURSE OBJECTIVES Upon completion of this course, students will be able to:	LEARNING ACTIVITIES
I. Introduction to Engineering (ongoing emphasis) A. What is engineering? B. Occupation awareness and educational requirements. C. Course outline according to careers	1. Explain basic career areas and gain awareness of opportunities in the engineering and technical fields. 2. Gain awareness of education and training required of different types of engineering and related careers.	TIMELINE: 1 week
II. Introduction to Drafting and Design		TIMELINE: 8 weeks
A. Safety in the classroom/lab (ongoing) 1. Importance of eye protection 2. Correct use of drafting equipment 3. Correct use of hand and power tools	1. Demonstrate safe use of all equipment and follow safety rules daily.	• CAD PROJECT: simple drawing applying basic principles. • APPLICATION PROBLEMS: (Culminating activity) Individual project to design and construct a packaging container incorporating drawing and design concepts.
B. Freehand sketching 1. Importance of sketching 2. Steps in sketching	1. Demonstrate correct sketching techniques. 2. Demonstrate an understanding of different sketching techniques.	
C. Technical drawing 1. Basic procedures a. Equipment use, care, and maintenance b. Drawing instruments and techniques c. Sheet layout	1. Demonstrate proper use of all equipment. 2. Demonstrate mastery of techniques as taught and practiced.	

COURSE CONTENT BY TOPIC OUTLINE	COURSE OBJECTIVES Upon completion of this course, students will be able to:	LEARNING ACTIVITIES
d. Lettering and line quality e. Geometry of technical drawing f. Dimensioning 2. View selection a. One-view drawings b. Two-view drawings c. Three-view drawings		
3. Developments a. Layout b. Construction 4. Basic CAD (computer aided drafting) a. Basic concepts and applications	1. Demonstrate mastery of CAD basics. 2. Demonstrate proficiency in apply drawing and CAD skills to projects throughout the year.	
D. Principles and elements of design 1. Balance and proportion 2. Texture 3. Scale 4. Lines 5. Ergonomics 6. Shading	1. Demonstrate an understanding of the principles and elements of design. 2. Demonstrate mastery of techniques as taught and practiced.	
III. Structural Engineering		TIMELINE:
A. Careers 1. Civil engineering 2. Architectural engineering 3. Occupation awareness and educational requirements.	1. Explain basic career areas and gain awareness of opportunities in the structural engineering and technical fields. 2. Gain awareness of education and training required for these careers.	A-D: 9 weeks E: 4 weeks

COURSE CONTENT BY TOPIC OUTLINE	COURSE OBJECTIVES Upon completion of this course, students will be able to:	LEARNING ACTIVITIES
B. Bridges--Background and Overview 1. Define a "structure." 2. History and types of bridges. a. Famous bridge architects. (1) John Roebling (2) Buckminster Fuller (3) Gustov Eiffel b. Types of bridges. (1) Beam (2) Truss (3) Arch (4) Cantilever (5) Suspension (6) Cable stay (7) Moveable 3. Structural physics of bridges. a. Forces (1) Live load/dead load (2) Stresses (3) Torque (4) Compression/tension (5) Math formulas for bridge testing. (a) Efficiency (b) Compression/tension b. Materials (1) Wood (2) Metal (3) Plastic (4) Composites	1. Define structure components. 2. Demonstrate knowledge of famous bridge builders. 3. Demonstrate mastery of structure knowledge through preparation of applications projects and presentation of research. 4. Explain and demonstrate through projects the physics principles related to bridge structures. 5. Calculate through formulas the compression/tension ratios and the efficiency. 6. Explain the various materials used to build bridges and analyze the pros and cons of each material.	• APPLICATION PROBLEMS: Presentation of research related to structures. OPTIONS: display panel or written report • PROJECT OPTIONS: 1. TSA Bridge Competition model. 2. Historical scale-model bridge. Documentation required throughout process. • CAD projects • Computer simulation: BRIDGE BUILDER

COURSE CONTENT BY TOPIC OUTLINE	COURSE OBJECTIVES Upon completion of this course, students will be able to:	LEARNING ACTIVITIES
C. Project Development 1. Development of working drawings 2. Preparing a bill of materials 3. Safety a. Safe use of hand and power tools. 4. Construction techniques	1. Demonstrate the ability to apply skills by preparing required drawings and bill of materials. 2. Demonstrate safe procedures when using all tools and equipment.	
D. Project Construction and Documentation 1. Testing of components of project and final project. 2. Oral project presentation.	1. Explain development and success of project design.	
E. Structures 1. History of structures a. Pyramids b. Greek architecture c. Aqueducts d. Castles and towers e. China Wall 2. Modern-day structures a. High rises b. Tunnels c. Sports structures 3. Future structures a. Outer space structures b. Possibilities for the future 4. Structural comparisons a. Human body b. Everyday items c. Use of various materials	1. Demonstrate an understanding of structures through history. 2. Explain structural comparisons during class discussion. 3. Demonstrate an awareness of materials and their impact on society and the earth.	(TIMELINE: 4 weeks) Explore possibilities with Tensegrity models and CAD.

COURSE CONTENT BY TOPIC OUTLINE	COURSE OBJECTIVES Upon completion of this course, students will be able to:	LEARNING ACTIVITIES
IV. Introduction to Control Technology		TIMELINE: A-G: 12 weeks H: 2 weeks
A. Careers 1. Mechanical engineering 2. Electrical engineering 3. Occupation awareness and educational requirements.	1. Explain basic career areas and gain awareness of opportunities in the engineering and technical fields. 2. Gain awareness of education and training required for types of engineering and related careers.	• Minimum of one activity to reinforce each basic type of control.
B. Mechanical control 1. History 2. Uses 3. Types C. Pneumatic and hydraulic 1. History 2. Uses 3. Types D. Electrical 1. History 2. Uses 3. Types	1. Explain and demonstrate how to apply various types of control to maneuver devices. 2. Demonstrate the ability to combine types of control to serve different needs. 3. Explain when one type of control is better for a particular application and why.	• PROJECT: Design and construct a child's tow using two or more forms of control. Prepare documentation and give oral report.
E. Prototyping 1. Modeling techniques 2. Modeling materials 3. Evaluation and critique with peers on project plans.	1. Demonstrate correct prototyping procedures and processes. 2. Participate in positive critiques of plans with peers.	(Teacher Note: use Legos as the prototype modeling tool)

COURSE CONTENT BY TOPIC OUTLINE	COURSE OBJECTIVES Upon completion of this course, students will be able to:	LEARNING ACTIVITIES
F. Project Development 1. Development of working drawings 2. Preparing a bill of materials 3. Safety a. Safe and correct use of hand and power tools. 4. Construction techniques 5. CAD drawings	1. Demonstrate the ability to apply skills by preparing required drawings and bill of materials. 2. Demonstrate safe procedures when using all tools and equipment. 3. Demonstrate skill growth using CAD.	• CAD APPLICATIONS: OPTIONS: Exploded partial view of control mechanism/s OR Assembly partial view
G. Project Construction and Documentation 1. Testing of components of project and final project. 2. Project presentation through oral reports.	1. Orally present project development and demonstrate completed project. 2. Successfully prepare project documentation.	
H. Robotics/Computer Control 1. Introduction to computer control 2. Robotics a. Defined b. Application (1) Sensors (2) Feedback (3) Servo motors	1. Demonstrate understanding of computer control through projects, documentation, and oral reports.	(TIMELINE: 2 weeks) Feedback activities Movit robots Possible field trips: NJIT CCM HS Tech Lab for demonstrations.

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EVALUATIVE CRITERIA

In order to complete the course with a passing grade (D or better), the student must successfully complete the following criteria with a minimum of 60% accuracy.

A. Written tests and quizzes
B. Drawing assignments
C. Log demonstrating problem-solving model for individual assignments
D. Final products developed through problem solving
E. Effort expended to do his/her best in the course

Appendix D

Departmental Student of the Month Selection Criteria

STUDENT OF THE MONTH

Business/Technology Education Department

1. CRITERIA CONSIDERED FOR SELECTION:

Leadership
Service
Cooperation
Positive Attitude
Academic Improvement
Initiative and Responsibility
Unique Contribution

2. RECOGNITION MONTHS:

September
October
November
January
February
March
April

Appendix E

Business/Technology Recruitment Newsletter

BUS/TECH NEWS

The Future is Now!

Business/Technology Education Department January 1992

SPECIAL EDITION

ELECTIVES--*THE DIFFERENCE IN YOUR LIFE*

Thinking about

BUSINESS ADMINISTRATION?

Get a jump on your competition--

Business Principles

Using a college text, you will explore business in today's world. How business is organized, how it works, why it succeeds or does not, where the United States fits into the world economy, ethics, environmental issues, and how and where YOU fit in.

Accounting I and II

Accounting is the language of business. A business major in college MUST take accounting. Why not get one step ahead and get the basics that will help you do even better in college!

Business Finance

(SEMESTER COURSE)

By popular demand--explore the subject of finance as it affects the world.

Starting a Business

(SEMESTER COURSE)

Learn the basics of owning and operating your own business to help ensure success!

Thinking about

ENGINEERING OR A TECHNICAL CAREER?

Know what your getting into and get prepared NOW!

Drafting and Design

A MUST HAVE BASIC SKILL FOR ALL TECHNICAL AND ENGINEERING PROGRAMS!

Continue with Architecture I & II and Advanced Drafting

Technology and Design

(SEMESTER COURSE)

Technology Education--exploring the process and things people make to extend our capabilities. Randolph has one of the best programs in the State of New Jersey.

Join an award winning program!

Robotics & Control Technology

(SEMESTER COURSE)

Explore a world where devices perform human functions. "Control" is a building block to many technical areas.

Electronics Technology

(SEMESTER COURSE)

Learn principles of electricity and electronics through project development.

INDUSTRIAL TECHNOLOGY

A solid path to good-paying career opportunities!

Whether you plan on college or immediately to work--explore these career paths.

AUTOMOTIVE TECHNOLOGY

Ever see those people along the roadway with car trouble standing in front of their car with the hood up staring at the engine hoping it will fix itself?
Ever think--
THANK GOODNESS THAT'S NOT ME!
Why take the chance? Many break downs are simple to fix IF you know where to start--LEARN--

INTRODUCTION TO AUTO
SMALL ENGINE REPAIR
ALL-TERRAIN VEHICLES
(SEMESTER COURSES)

Train for a lifetime career:
AUTO MECHANICS
(DOUBLE PERIOD)

WOODS TECHNOLOGY

Have you seen what they are building in the wood shop lately?
Stereo cabinets, four-draw cabinets, end tables, four-poster beds, and many other pieces of FINE FURNITURE.

Think you can't do it?
THINK AGAIN!

You'll be taught everything from how to measure wood to the final step on that beautiful piece of furniture. TRY IT!

WOODS TECHNOLOGY
Program of Studies:

Semester Courses:

BASIC WOODS
MACHINE WOODS
INLAID WOODS

Spend a full year learning a skill that can lead to your own business or a career:

CABINET MAKING
ADVANCED WOODS

COOPERATIVE EDUCATION WORK-STUDY PROGRAMS

CIE (Industrial)
CBE (Business)
CME (Marketing)

Valuable on-the-job training in local businesses.

THIS WILL NOT HURT YOUR CHANCES OF BEING ACCEPTED TO COLLEGE
- AND -
IT MAY HELP!

Successful completion of this program shows a commitment to learning, responsibility, maturity--and you make money too!

See Mr. or Mrs. Turner--B101

BUSINESS TECHNOLOGY STUDIES

Using the computer as a tool for
personal applications—

COMPUTER APPLICATIONS
ADVANCED COMPUTER APP.

and *training for business*—

INTRODUCTION TO WORD PROCESSING
WORD PROCESSING I
BUSINESS APPLICATIONS

Learn the most widely used software for a variety of purposes. You'll learn LOTUS 1-2-3, Word Perfect, Q & A, and others.

ATTENTION JUNIORS

For your SENIOR year!
By popular demand--

BRUSH-UP KEYBOARDING FOR SENIORS

NOW do you see the need to type (keyboard) correctly? You NEED the skill in college and in life. Brush up your typing skills or learn if you never have. Brush up on PROPERLY preparing [illegible] papers/manuscripts. [illegible] SEM[illegible]

MATCH IT WITH

COLLEGE NOTETAKING!

Learn how to effectively take notes in any lecture setting and how to study for and do well on tests. Designed for the college bound with hints on college life!

Make a personal commitment to WRITE and STUDY SMARTER!

PERSONAL AND BUSINESS LAW I and II

LAW I--STUDENT RIGHTS AND CIVIL LAW
LAW II--CRIMINAL AND FAMILY LAW

Do you know your rights and do you know the responsibilities expected of you as a result of those rights? What about the laws affecting your property, your right to sue or be sued, laws regarding marriage and divorce? What happens if you are arrested and what is criminal justice? Learn by looking at actual cases and hearing experts in the field.

These could be the most important courses you ever take!

KNOW YOUR TEACHERS

See them for more information and see your guidance counselor to sign up!

Auto: Mr. Latham *(A109)*
Woods: Mr. Hannon *(A111)*
Technology/Electronics: Mr. Collict *(A108)*
Drafting/Architecture: Mr. Turner *and* Mr. Wilhelm *(B233)*
CIE: Mr. Turner *(B101)*
Computer Applications: Mrs. Afford *or* Mrs. Dilling *(B112/111)*
Accounting: Mr. Hahn *(B104)*
Word Processing: Mrs. Palladino *(B111)*
Law: Mrs. Dilling *(B101)*
Business Administration: Mrs. Flynn *(B101)*
Senior Keyboarding and Note Taking: Mrs. Turner *or* Mrs. Palladino *(B111)*
CBE and CME: Mrs. Turner *(B101)*

TECHNOLOGY EDUCATION

GRADE 9	GRADE 10	GRADE 11	GRADE 12
PRE-ENGINEERING TECHNOLOGY			
Technology and Design*** Robotics & Control Technology*** (Pre: Tech and Design)	Robotics & Control Technology (Pre: Tech and Design) Electronics Technology I Electronics Technology II (Pre: Electronics Tech I)	Inventions and Innovations (Offered September 1993) (Pre: Technology and Design) (Recommended but not required: Electronics Tech I)	
Drafting and Design	Architecture I—Residential Design (Pre: Drafting and Design)	Architecture II—Modeling (Pre: Two years of Drafting)	Advanced Drafting (Pre: Three years of Drafting)
INDUSTRIAL TECHNOLOGY			**WORK STUDY PROGRAM** CIE (Industrial Education)
Introduction to Auto*** Small Engine Repair***	Small engine Repair*** All-Terrain Vehicles*** (Pre: Small Engine Repair)	Auto Mechanics – Double Period (Pre: Introduction to Auto)	
Basic Woods*** Machine Woods***	Machine Woods *** Inlaid Woods*** (Pre: Basic & Machine Woods) Cabinet Making (Pre: Basic & Machine Woods)	Advanced Woods (Pre: Basic and Machine Woods)	

BUSINESS EDUCATION

BUSINESS TECHNOLOGY STUDIES			**WORK STUDY PROGRAMS**
Personal Keyboarding*** Introduction to Word Processing	Word Processing I (Pre: Intro. to Word Processing or teacher recommendation from Personal Keyboarding) Computer Applications	Business Applications (Pre: Word Processing I) Advanced Computer Applications (Pre: Computer Applications)	CBE (Business Education) CME (Marketing Education)
BUSINESS ADMINISTRATION			
	Accounting I	Accounting I (Pre: Accounting I) Business Principles Starting a Business*** Business Finance***	
PERSONAL BUSINESS STUDIES			
	Personal Finance	Law I—Student Rights and Civil Law*** Law II—Criminal and Family Law***	Brush-Up Keyboarding for Seniors*** College Note Taking***

***SEMESTER COURSES

Appendix F

Grant Personnel Job Descriptions

ELEMENTARY CURRICULUM COORDINATOR

CANDIDATE QUALITIES AND REQUIREMENTS:

The candidate must have a strong background in the development and implementation of technology education as outlined by the Commission of Technology Education for the State of New Jersey. The candidate must have prior elementary, K-6, teaching experience, preferably in industrial arts/technology education. The candidate must have experience in curriculum development, have good organizational skills, management skills, and human relations skills.

CERTIFICATION:

MA in Educational Administration, Supervisor's Certificate, and K-6 teaching experience.

ROLES/RESPONSIBILITIES/SUPPORT REQUIREMENTS:

The elementary curriculum coordinator will be responsible for the direction and implementation of the entire TELS project under the direction of the project director.

This person will coordinate the day-to-day activities to include:

1. coordination of committee meetings;
2. coordination of in-service programs;
3. curriculum development;
4. curriculum implementation;
5. coordination of cooperative learning and mentoring components;
6. development of newsletters as required, including the writing of a minimum of one article for each grant newsletter;
7. coordination of activities related to the statewide conference;
8. distribution of all TELS related materials as required or needed;
9. liaison between grant participants and the appropriate district staff.

ELEMENTARY GUIDANCE COUNSELOR

CANDIDATE QUALITIES AND REQUIREMENTS:

The candidate must have teaching experience on the elementary level, K-6, and be familiar with a wide range of current career opportunities. The candidate must show evidence of enthusiasm, open-mindedness, creativity, energy, cooperativeness, and be skilled in group dynamics and individual counseling. A central focus will be communication among classroom teachers, parents, and representatives of industry.

CERTIFICATION:

MA in Pupil Personnel Services and K-6 teaching experience.

ROLES/RESPONSIBILITIES/SUPPORT REQUIREMENTS:

The elementary guidance counselor will:

1. develop ad implement a system of individual career plans for all students, K-6;
2. develop and implement a minimum of three counseling activities targeting students identified "at risk" due to economic and/or social disadvantages;
3. develop a packet describing the counseling activities;
4. write a minimum of one article for each grant newsletter;
5. develop and implement four career development activities focusing on gender equity.

Appendix G

Post Workshop TELS Questionnaire

TELS GRANT

Grades K-3 Questionnaire

You need not put your name on this paper. Please offer your perspective on the following and return by next **Thursday, Oct. 24**. If you would like to attend the December 2 workshop at Trenton State, please let us know by next **Tuesday, Oct. 22.**

The technology process can be successful in any class and part of our job is to help you succeed. We already know some areas we need to work on to make that possible--your input will help further. Please remember that we need three original TLA's stressing math and three stressing language arts from each grade level. Working across schools will help with some of the problems you expressed with perceived competition between the schools. Please realize we are not asking you to change your classroom today and forever, we are asking you to help develop and field test three activities and be resources for each other as we are for you.

"All of us are smarter than any one of us."

1. What do you see as the main obstacle/s to implementing the technology process in your classroom.

2. If we were able to overcome the above the major obstacle/s, what other problems do you perceive in implementation?

3. We would like your suggestions for when to hold future meetings. Realizing that all meetings cannot take you from your students, what other options/ suggestions do you have? (eg., paid Saturday or holiday meetings, half-day inservice, before school, other)

Can you ever meet after school?

What days would be best?

5.a. Begin to think about the activities you do already. Walking in your schools we see timelines, maps students make and other student-made things hanging in the halls. How could you turn an existing activity into a TLA?

5.b. After thinking of that and considering the types of activities you were involved in over the two days, what types of materials would you need to make things like this happen in your classroom?

4. We have money to purchase equipment for the schools. We haven't discussed this at length, but do you have any suggestions at this time which would enhance your students' learning?

Please remember that Randolph has committed to this project and it has to happen over this year. If we can continue to communicate and work together, it can be an exciting and rewarding experience for both you and your students!

Appendix H

Sample Personalized Teacher Memo

RANDOLPH TOWNSHIP SCHOOLS

Business/Technology Education Department

TO: Betty Snyder

FROM: Joyce Maehrlein

DATE: January 16, 1992

SUBJECT: TELS ACTIVITY

Betty, I want to thank you for your active, quality participation in TELS. Scott shared with me his excitement over your activity, BOATS THAT FLOAT, and how successful you were using various technology concepts. He commented to me that your presentation of the problem and particularly your handling of less than successful test boats was wonderful. Actually the word he couldn't stop using when telling me of your T.L.A. was awesome. These activities are excellent ways to encourage students to try ideas and not feel unsuccessful attempts are personal failures. It allows each children to take pride in themselves. Obviously, you know this is true and are successfully reinforcing these ideas.

Thanks for your continued participation. Of course we need the TLAs for the grant, but quality participation such as yours transcends the grant. I truly believe that students at early ages need to be challenged to think and taught to pursue creative solutions to all types of problems. It helps them make sense of school, their role in the future, and how to integrate knowledge to meet needs. These skills are absolutely critical for children looking toward an uncertain future in a changing world. It is special people like you, grabbing onto exciting new ways to challenge students, that will make the difference in the lives of the children you touch. Thanks.

pc: E. Geueke

Appendix I

Sample Technology Learning Activity (TLA)

GRADE 2

TECHNOLOGY-LEARNING-ACTIVITY

ACADEMIC EMPHASIS	THEME	OTHER SPECIFIC EMPHASIS	CONTRIBUTORS
MATH	CREATURE CLOCKS	SCIENCE (SIMPLE MACHINES)	BERNICE RALLO DEBRA BARTON KATHY PFISTER JANE SCOLES

SPECIFIC LEARNING ACTIVITIES:

By the end of this activity, each student will have accomplished:

1. Developing a creature which incorporates a clock on its body and which the students can use to help learn time.
2. Preparing documentation.

DESIGN BRIEF

Description of the problem and resources the students will be allowed to use in preparing their solutions.

PROBLEM/SOLUTION:

Learning to tell time is fun, but it can also be challenging. You have been hired as a consultant for the Fun Time Toy Co. Inc. to help create a clock which will make learning to tell time more fun.

Design and build an original "creature clock" which will incorporate either a lever or a wheel and axle into the movement.

RESOURCES:

Time (how much is needed)

Five day, 30 minutes daily:

One 30-minute period for planning, two 30-minute periods to make the basic creature, two 30-minute periods for the assembly of the clock.

Energy (such as batteries or human)

Human

People (how many in each group)

Individual

Knowledge (where can it be found)

1. Teacher lesson and demonstrations.
2. Prior knowledge learned from CLOCKWORKS software.

Material (supplies allowed to be used)

Cereal box (brought in from home), construction paper, glue, straws, brass fasteners, markers, crayons, pompoms, beads, moveable eyes, and other materials from home as PREAPPROVED by the teacher.

NOTE: Teacher pre-cut and prepunched with holes: wheels (approx. 4" diameter) and various lengths of 1" strips of cardboard to act as levers and wheels/axles.

Capital (how much money will it cost)

None

Tools and Equipment

Scissors, hole puncher

TEACHER PREPARATION

Background:

Teacher pre-cut and prepunched with holes: wheels (approx. 4" diameter) and various lengths of 1" strips of cardboard to act as levers and wheels/axles.

Lesson Introduction:

A gear can be described as a wheel with teeth. Gears are usually attached to a shaft which is similar to an axle. Think about a bicycle. You know where the gears are and what they look like—a wheel with teeth. The axle or shaft is attached to the pedal, and by pushing on that axle or shaft, the gears turn and the bicycle goes.

Think about a swatch watch—does anyone have one. Look at all the gears, and in the middle of the gears is a shaft or axle which makes them turn. The clock on the wall works the same way. Clocks contain many gears which all work together to move the minute and second hand on the face of the clock. Today we are going to concentrate these simple machines, the lever and wheel and axle, to see how we can incorporate them into our projects. (Could continue discussion with other examples of where a lever and wheel and axle might be found in our everyday life.)

Lesson Plan:

1. Teacher lessons on telling time using an analog clock.
2. Use CLOCKWORKS in the computer lab.
3. Students bring in a cereal box from home as the basis for the creature.
4. 30-minutes for planning clock.
5. Two 30-minute periods to make the basic creature from cereal box.
6. Two 30-minute periods for the assembly of the clock.

Progress Checkpoints:

1. Teacher approval after planning and before they begin construction.
2. Informal checks throughout construction.

INTERDISCIPLINARY POSSIBILITIES:

Writing

1. Story problems, eg., It is now 9 o'clock. What time will it be in 2 hours?
2. Have each child create a story explaining their creature and the part the clock plays in the creature.
3. Have children give oral reports on their creature.

Reading

None

Vocabulary

Terms related to time keeping such as minutes, hours, etc.

lever, axle, wheel

Math

See lesson objectives.

Science

A.M. and P.M.

Principles of simple machines.

Social Studies

Time zones and geography.

Career Awareness

Problem-solving skills, the importance of being on time, self esteem, and confidence building.

Computers

CLOCKWORKS (MECC software available in labs).

LESSON GRADE-LEVEL OBJECTIVES:

1. Tells time to the hour with five minute intervals.
2. Reads numbers to 12.
3. Counts by 5.
4. Identifies circles, squares, and other shapes/patterns.

TECHNOLOGY EDUCATION PROFICIENCIES

- Identify and demonstrate safety procedures and methods established by the teacher to process materials, energy, and information.
- Communicate and process information effectively in the development, presentation, and evaluation of solutions to problems.
- Work independently and cooperatively in technological activities.
- Think creatively and critically to explore, discover and solve technological problems.

NATIONAL CAREER DEVELOPMENT GUIDELINES—ELEMENTARY

SELF-KNOWLEDGE:

Knowledge of the importance of self-concept (COMPETENCY I)

- Demonstrate a positive attitude about self.

EDUCATIONAL AND OCCUPATIONAL EXPLORATION:

Awareness of the importance of personal responsibility and good work habits (COMPETENCY VII)

- Demonstrate positive ways to performing working activities.

CAREER PLANNING:

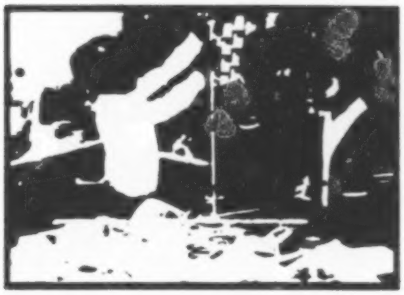
Understanding how to make decisions (COMPETENCY IX)

- Describe what can be learned from making mistakes.
- Identify strategies used in solving problems.
- Identify alternatives in decision-making situations.

Appendix J

TELS Conference Brochure

TEACHING ESSENTIAL LIFE SKILLS CONFERENCE



MAY 29, 1992

HYATT REGENCY NEW BRUNSWICK

TELS CONFERENCE

OVERVIEW: The **Teaching Essential Life Skills** (TELS) Grant serves as a catalyst for the "Integration of Technology Education and Guidance Activities In Elementary Education." Conference participants will receive the **National Career Development Guidelines** and the **Technology Education Proficiencies**. Also, field-tested packets of learning activities for elementary teachers and guidance counselors will be available from each TELS school district.

KEYNOTE: **Dr. Alice Dyer**, a Life Skills Educator with over 25 years of experience, previously worked as a New York State Department of Education Supervisor of Life Skills Education. She will focus her address on "Life Skills: Learning As A Human Technology."

Educators will experience the joy of theories and practices of human learning and gain strategies and skills in brain compatible learning during this participatory session. Attendees will also review "Innovative Learning Models in America", the nationally recognized life skills models.

SCHEDULE:

8:00 - 8:45 a.m.	Registration, Refreshments and Exhibits
8:45 - 9:00 a.m.	Opening Remarks--Dr. Thomas Henry, Assistant Commissioner NJ State Department of Education, Division of Vocational Education
9:00 - 10:10 a.m.	Keynote Address--Dr. Alice Dyer, Life Skills Educator
10:20 - 11:20 a.m.	Workshop Session I
11:40 - 12:40 p.m.	Workshop Session II
12:40 - 1:20 p.m.	Exhibit Session
1:20 - 2:30 p.m.	Luncheon & Closing Remarks

SPONSORS: School District Recipients of the TELS Grant, funded through the New Jersey State Department of Education, Division of Vocational Education:

East Orange
Hackettstown
Lawrence Township
Montclair
Penns Grove-Carneys Point
Randolph Township
Washington Township (Sewell)
West Deptford

CO-SPONSORS:

Commission on Technology Education for the State of New Jersey
Nabisco Brands, Inc.
New Jersey Career Development Association
New Jersey Occupational Information Coordinating Committee
New Jersey School Counselors Association
Technology Education Association of New Jersey

Photographs show students and teachers engaged in TELS learning activities.

WORKSHOP SESSION I

1. **Focus Workshop: East Orange School District**
   The East Orange School District will highlight the collective efforts of students solving technology problems. The counseling aspect of the TELS program, the "I Can" Plan, will also be featured and includes emphasis on conflict resolution and decision making processes.
   Presenters: Dennis Martin, Project Director; Frank Falcicchio, Curriculum Coordinator; Carolyn Tomfohrde, Guidance Counselor

2. **Focus Workshop: Hackettstown School District**
   Hackettstown debuts a TELS curriculum that employs problem solving, creative thinking techniques, and activities which engage students in preparation for the challenges of the 21st century. Participants will be exposed to a multimedia overview of the piloting of the project.
   Presenters: Paula Hartmann, Project Director; Janet Jaworski, Curriculum Coordinator; Denise Meehan, Guidance Counselor

3. **Focus Workshop: Randolph Township School District**
   "Gifted Education for All Students" showcases six open-ended problem solving and critical thinking activities for each grade level. The guidance component involves setting the foundation for an elementary guidance program and activities targeting gender equity and success at school.
   Presenters: Joyce Maehrlein, Project Director; Scott Pepper, Curriculum Coordinator; Arlene Block, Guidance Counselor

4. **Focus Workshop: West Deptford School District**
   This presentation will feature how a district integrated reading, writing and speaking throughout the curriculum. Five critical experiences developed through the Penn Literacy Network will be discussed.
   Presenters: George Faunce, Project Director; Patricia Ripley, Curriculum Coordinator; Marjorie Chassels, Guidance Counselor

5. **Session for Administrators**
   Come join TELS Project Directors for an open, informal, interactive "chat" about designing and implementing this type of program in your school district. Attendees will be encouraged to ask questions, offer suggestions and learn more about TELS from the administrator's viewpoint.
   Facilitator: Doug Groff, Penns Grove-Carneys Point School District

6. **Session for Guidance Counselors**
   Several topics discussed at this guidance counselor session will be: infusion and implementation of the National Career Development Guidelines, needs assessment instruments, identification of an "at-risk" population, and incorporation of the problem solving model into guidance services.
   Facilitator: Ogden Kruger, Lawrence Township School District

7. **Technology Education In The Elementary Classroom**
   Learn how to infuse technology education into your elementary curriculum. Student proficiencies and sample lessons for starting and expanding technology education programs will be shared. Participants will receive a copy of the Technology Education Proficiencies.
   Presenters: Kathy Hartford, Principal-Paulsboro School District; Andrea Notare, Grant Administrator-Hasbrouck Heights School District; Joanne Smeltz, Teacher-West Deptford School District, and K-12 Technology Education Proficiencies Development Committee Members

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WORKSHOP SESSION II

8. **Focus Workshop: Lawrence Township School District**
"Success in the 21st Century" is dependent on preparing our students for the school-to-work transition by integrating the existing curriculum with a thinking, "life skills" curriculum. Training students in the art of learning and gaining a better sense of self are the key elements of this workshop.
Presenters: Dr. Bruce McGraw, Project Director; Marianne Colavita, Curriculum Coordinator; Ogden Kruger, Guidance Counselor

9. **Focus Workshop: Montclair School District**
Teachers and counselors will demonstrate the Learning Lab process for teacher-training and field-testing Technology Learning Activities. They will also discuss the Total on Target approach, which focuses attention on students exhibiting deficiencies in achievement and/or self esteem.
Presenters: Dr. Faith Spitz, Project Director; Michael Grieco, Curriculum Coordinator; Bob Goger, Guidance Counselor

10 **Focus Workshop: Penns Grove-Carneys Point School District**
Highlights of this session will include 84 student workbooks that integrate teaching essential life skills into the existing whole language and math curriculum, bringing guidance into the classroom, and providing information on how to get schools, businesses, and the local community involved.
Presenters: Doug Groff, Project Director; Mary Carter, Curriculum Coordinator; Steve Garbini, Guidance Counselor

11 **Focus Workshop: Washington Township School District (Sewell)**
Featured TELS activities include five Technology Learning Activities for each grade level that contain curriculum based Technology and Career/Life Skills components and two unique Life Skills/Career Activities which have been developed for children at risk.
Presenters: Ed Denton, Project Director; Bob Baum, Curriculum Coordinator; Sandy Ross, Guidance Counselor

12 **Session for Curriculum Coordinators and Elementary Teachers**
Curriculum coordinators and teachers working on the TELS Grant will provide a classroom perspective on developing and carrying out Technology Learning Activities. Come find out what we did and how we did it in this question and answer forum.
Facilitator: Scott Pepper, Randolph Township School District

13 **Practical Application of the National Career Development Guidelines**
This workshop will provide an overview and the rationale behind the National Career Development Guidelines. Implementation strategies using lesson plans and career development techniques will be addressed by a school district utilizing these guidelines. A copy of these guidelines will be distributed.
Presenters: Ann De Angelo, NJ State Department of Education; Arlene Schacht, Guidance Chairperson, and Russell Walling, Career Counselor, Neptune Township School District

14 **Grants Funding**
Discover the types of grants available, the sources of funding, and the procedures for writing a grant.
Presenter: Greg Schuler, Acting Manager, Grants and Contracts, NJ State Department of Education

REGISTRATION FORM

Registrations will be processed in the order they are received. Registration deadline is **May 15, 1992.** There will be **limited** on-site registration. Please print and complete one form for each registrant:

NAME____

SCHOOL/BUSINESS__________________________________

ADDRESS______________________________________

CITY/STATE________________________ ZIP CODE____________

TELEPHONE: WORK____________________ HOME______________

Check Appropriate Position:

( ) Teacher

( ) Presenter

( ) Guidance Counselor

( ) Exhibitor/Vendor

( ) Supervisor/Administrator

( ) Other______________

Workshop Sessions: Select three and indicate by workshop number.

Session I: ( ) ( ) ( )

Session II: ( ) ( ) ( )

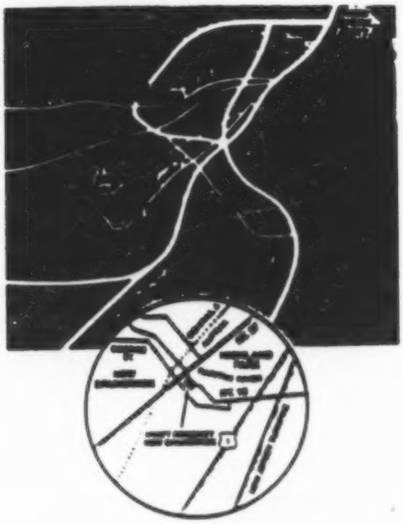
REGISTRATION FEE: $20.00 (Includes refreshments, luncheon, and conference materials)
Make check payable to: TELS Grant Conference Account

Return Registration Form and Conference Fee by **May 15th** to:
TELS Conference, Management Resources, Five Sussex Road, Morganville, NJ 07751-1331

For Conference Information: Contact Marcie Horowitz, Conference Coordinator, at (908) 536-2114.

HYATT REGENCY NEW BRUNSWICK

TWO ALBANY STREET
NEW BRUNSWICK, NEW JERSEY 08901 USA
201 873 1234 TELEX [illegible]



From New Jersey Turnpike: Exit Turnpike at Exit 9. Bear right onto Rt. 18, heading North. Continue on Rt. 18 for 3 miles. Exit 18 for Rt. 27 South (Princeton). Loop under Rt. 18, and at second light, make a left. Hotel is on your left.

From Route 287: Exit 287 for Easton Ave. (New Brunswick). Stay on Easton Ave. till it dead-ends (7 miles). Make left onto Albany St. (Rt. 27). At second light, make a right. Hotel is on your left.

From Garden State Parkway: Exit Parkway at 130 for Rt. 1 South. Exit Rt. 1 for Rt. 18 North (New Brunswick). Stay on Rt. 18 for 2½ miles. Exit Rt. 18 for Rt. 27 South (Princeton). Loop under Rt. 18, and at second light, make a left. Hotel is on your left.

From Route 1: Exit Rt. 1 for Rt. 18 North. Stay on Rt. 18 for 2½ miles. Exit Rt. 18 for Rt. 27 South (Princeton). Loop under Rt. 18, and at second light, make a left. Hotel is on your left.

Parking: Located in adjacent deck. Upon departure, present ticket and mention "TELS" to guarantee free parking.

Reservations: Call Hyatt Regency at 1-908-873-1234 and request room rates of $99 single, $109 double by May 15th.

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TEACHING ESSENTIAL LIFE SKILLS CONFERENCE

May 29, 1992 Hyatt Regency New Brunswick

TELS Conference
Marcie Horowitz, Conference Coordinator
Management Resources
5 Sussex Road
Morganville, NJ 07751

FIRST CLASS
US POSTAGE
PAID
Permit No. 87
Englishtown, NJ
07726

TELS CONFERENCE:
Integration of Technology Education
and Guidance Activities in Elementary Education

Appendix K

Gender Friendly Technology Education Workshop Handout

RANDOLPH TOWNSHIP SCHOOLS
Millbrook Avenue
Randolph, NJ 07869

GENDER FRIENDLY
Technology Education

Joyce J. Maehrlein
201-989-7179
May 1992

GENDER EQUITY

LIMITED LISTING OF GENERAL RESOURCES AND PROFESSIONAL READINGS

American Association of University Women
1111 Sixteenth Street N.W., Washington, DC 20036-4873

Publications include:
Shortchanging Girls, Shortchanging America. (1991).

The AAUW Report: How Schools Shortchange Girls. (1992).
Also available: Executive Summary which includes recommendations for educators, and Action Guide offering strategies to combat gender bias in schools.

Bitters, B. & Keys, M. (1988). Classroom Activities in Sex Equity for Developmental Guidance. WISCONSIN DEPARTMENT OF PUBLIC INSTRUCTION.

Challenging the Stereotypes: Activities for the Classroom. TRENTON STATE COLLEGE.

Consortium for Educational Equity
Arlene S. Chasek, Project Director
Rutgers, The State University of New Jersey
Kilmer Campus 4090
New Brunswick, NJ 08903

International Technology Education Association.
1914 Association Drive, Reston, VA 22091

New Jersey Sex Equity Technical Assistance Centers:

PROJECT RAE--Equity Assessment Services
Joanne Cote-Bonanno, Director
Montclair State College
Life Skills Center
Upper Montclair, NJ 07043
201-893-4172

PROJECT TIDE--Staff Development, Workshops, and Conferences
Mary Switzer, Director
Trenton State College
Martin House
Hillwood Lakes, CN4700
Trenton, NJ 08650
609-771-2816/2714

PROJECT VOW--Resources and Marketing
Carole Ucciferri, Director
Jersey City State College
2039 Kennedy Blvd.
Jersey City, NJ 07305
201-200-2188

Project VOW offers many helpful, free materials. Catalog available.

The Secretary's Commission on Achieving Necessary Skills. (1991, June). *What Work Requires of Schools--A SCANS Report for America 2000*. Washington, DC: U.S. Department of Labor.

New Jersey Vocational Equity Resource Catalog. (1991). NEW JERSEY STATE DEPARTMENT OF EDUCATION.

Sadker, M., Sadker, D., & Steindam, S. (1989, March). *Gender Equity and Education Reform*. EDUCATIONAL LEADERSHIP, p. 44-47.

Westoff, L. A. (Ed.). (1979). *Women--In Search of Equality (Focus 6)*. Princeton, NJ: Educational Testing Service.

GENDER FRIENDLY TECHNOLOGY LEARNING ACTIVITIES

Special thanks to Robert Garay, Scott Pepper, and Sanford Feld for sharing their successful activities.

** Denoted activities particularly popular with female students.

STRUCTURES

BRIEF INTRODUCTORY PROBLEMS:

1) Design and build a structure that can extend over the edge of the table as far as possible and support a whiffle golf ball.
CRITERIA:
   a. Structure can be attached to the table ONLY (cannot be attached to floor, chairs, people, or anything else).
   b. Structure must remain free standing for a minimum of 10 seconds while holding the ball.
   c. You have 20 minutes to plan and construct.
   d. Materials: 20 sheets of 8-1/2 x 11 copy paper
      12" of masking tape
      2 paper clips
      1 whiffle gold ball

2) Thousands of acres of forests are destroyed by fires every year. Many of these fires are caused by carelessness and can be easily avoided. Early detection of a fire can help minimize damage to our precious forests. Because of your expertise and family background (your great grandfather was Gustav Eiffel), you have been hired by the National Park Service to design and build an observation structure which can be used in the early detection of fires.
CRITERIA:
   a. The structure must be freestanding.
   b. Structure must support an observation deck (5x8 index card).
   c. You have 30 minutes for planning and construction.
   d. Materials: 25 strands of perciatelli #6 (spaghetti), mini marshmallows (allow to get somewhat stale), 12 inches of masking tape.
ALTERNATIVE: Ten sheets of newspaper and masking tape to hold a whiffle ball or ping pong ball.

ADVANCED PROJECTS: These projects are designed to last from two to four weeks. The intensity of the research required and additional criteria impacts the time. The testing of solutions can result in class participation and evaluation which may also take more time.

**1) Your parents are so impressed with your expertise in engineering concepts that they have asked you to help them plan an outdoor

area where the family can enjoy the yard and the nice weather. Design and build a deck or gazebo for your own home.
CRITERIA:
- a. Design and model should be for your own home.
- b. Model must be 1/12 scale.
- c. Model to be built of balsa wood.
- d. Design specifications should include cost of structure.

**2) The neighborhood park has an open field which the Parks Department would like to convert to a playground for very young children. Hearing of your successes in technology and design classes, the Parks Department has asked you to design and build a scale model of a playground for preschool children.
CRITERIA:
- a. Design for preschool children 3-5 years old.
- b. Model must be 1/12 scale.
- c. Model can be built of any materials found in the lab.
- d. Playground design should be ergonomically correct.
- e. Playground model should include safety considerations.

ALTERNATIVES: A group of four to six students to design an entire playground; groups of two or individual students could design one piece of equipment.

3) Balsa compression structure:
Design and build a structure using only 48" of balsa wood to protect an egg from 25 pounds of weight applied atop your structure.
CRITERIA:
- a. A raw, large-sized egg must fit under or inside structure.
- b. Steel plate weight must balance atop structure.
- c. Can use only 48" of 1/8" x 1/8" balsa strips.
- d. Can use up to 18" of thin string (supplied).
- e. Can use white Elmer's glue.

4) Truss Bridge (specifications of Technology Student Association Competitions)
Could be a major unit of study for a semester or full-year course.

CHILDREN'S TOYS

**1) DESIGN BRIEF:
Design and construct a toy suitable for children 3-5 years old.
CRITERIA:
- a. Must use at least one simple machine principle.
- b. The toy should be no larger than 18" x 18".

OPTIONS:

- Associate this project with the high school preschool or an area preschool. The testing of the project could involve having small children play with the toy and determining how they liked it and why. This could also lead to discussions on patents, mass production, marketing, and consumerism.
- Could be a community service project for a Head Start program, depending on the finishing techniques employed.
- Can be an excellent cross-over project for wood shop.
- Use pine if tools and basic power tools are available. Can use balsa blocks, but finished products would not be sturdy enough for actual play.
- Remember safety instruction and safety glasses.

COMPUTER GRAPHICS

**1) Computer-Aided Technical Drawings (CAD programs most appropriate, but highly sophisticated program not necessary).

POSSIBLE ACTIVITIES THAT HAVE BEEN SUCCESSFUL:

a. Prepare a computer-generated drawing of a structure designed previously, such as the deck or bridge structures.
b. Design a house.
c. Design a sports field.

**2) Computer-Designed Persuasion Poster.

a. lab safety poster
b. energy conservation poster
c. environmental awareness poster
d. drug awareness

**3) Multi-Media Computer Presentation

Can include any combination of computer with camcorder, sound digitizing, VCR recordings, and other equipment as available.

THEN AND NOW ACTIVITIES (INVENTIONS)

**DESIGN BRIEF

Situation:

It is fascinating to look at how inventions have evolved over time. Something as simple as the napkin has a rich history which began approximately 2500 years ago in the Near East. These early napkins, called "serviettes," were the size of a towel. Ancient Egyptians, the Greeks, and the Romans used these large napkins to wipe the food from their hands.

The Romans instituted a second use for serviettes. Guests were expected to use the serviette as a sort of "doggie bag" to take food home with them. It was considered an insult not to take advantage of this hospitality.

It was the creation of another invention that redefined the size of the napkin as we know it today. With the widespread acceptance and use of the fork, people no longer needed to wipe their hands as frequently.

Problem/Solution:

Design and draw a poster/display panel which will depict the evolution of a device commonly used in our lives. Show the device as it appeared sometime in the past, its current appearance and features, and a PREDICTION of what the device will look like and how it will work in the future.

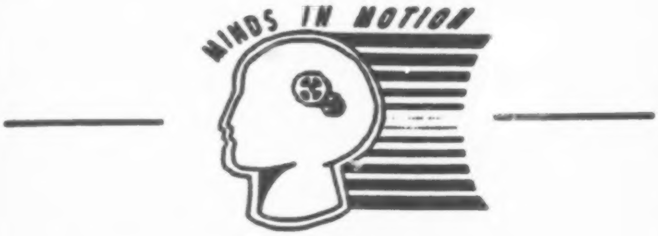
CRITERIA:
- a. The display panel cannot exceed 18" x 24".
- b. A brief description should accompany each drawing.
- c. You will have 45 minutes to plan and construct.
- d. You can use markers, rulers, and letter templates.

Appendix L

Integration of TELS Logo and New TELLS Project Title

TELLS

Technology Education for Lifelong Learning Skills



Randolph Township Schools

Randolph • New Jersey